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# Graduate School Catalog 1967-1968

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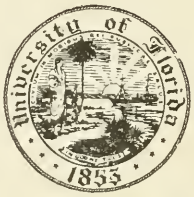


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# Graduate School Catalog

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GAINESVILLE 1967–1968

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# *Contents*


Officers of Administration ..... v
University Calendar ..... ix


## GENERAL INFORMATION


Organization and History ..... 1
Graduate Programs ..... 2
Admission ..... 4
General Regulations and Instructions ..... 9
Requirements for Master's Degrees ..... 14
Requirements for the Ed.S. and Ed.D. ..... 27
Requirements for the Ph.D. ..... 31
Expenses ..... 36
Housing ..... 40
Financial Aid ..... 42
Special Programs and Facilities ..... 48
Organized Research ..... 56
Student Services ..... 58


## COURSES OF INSTRUCTION


College of Agriculture ..... 63
School of Forestry ..... 88
College of Architecture and Fine Arts ..... 91
College of Arts and Sciences ..... 95
School of Journalism and Communications ..... 141
Division of Biological Sciences ..... 158
College of Business Administration ..... 145
College of Education ..... 159
College of Engineering ..... 177
College of Health Related Professions ..... 215
College of Medicine ..... 217
College of Nursing ..... 231
College of Pharmacy ..... 235
College of Physical Education and Health ..... 239

Index ..... 243

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# 1967

**JANUARY**

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**AUGUST**

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**OCTOBER**

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# 1968

**JANUARY**

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**FEBRUARY**

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**MARCH**

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**APRIL**

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**MAY**

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**JUNE**

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**JULY**

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**AUGUST**

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**SEPTEMBER**

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**OCTOBER**

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**NOVEMBER**

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**DECEMBER**

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# *University of Florida Calendar* 1967–1968*

## FALL QUARTER—1967

| | |
|---|---|
| JULY 21, Friday | Last day for those not previously in attendance at the University of Florida to file application for admission for the Fall Quarter. Students whose admissions have not been cleared by September 6 will be assigned late registration appointments. |
| SEPTEMBER 6, Wednesday, 5:00 p.m. | Last day for those previously in attendance at the University of Florida to apply for registration appointments in the regular registration period. Those who apply or clear after this date will be assigned late registration appointments. |
| SEPTEMBER 18-22, Monday-Friday | Registration according to appointments assigned. No one permitted to start registration after 3:00 p.m. on Friday, September 22. |
| SEPTEMBER 25, Monday | Classes begin. Last time for completing registration for Fall Quarter. No one permitted to start registration after 3:00 p.m. on Monday, September 25. All registration fees increased $25. |
| SEPTEMBER 29, Friday, 5:00 p.m. | Last time for adding courses and for changing sections. |
| SEPTEMBER 29, Friday, 5:00 p.m. | Last time for paying examination fee at the Cashier's Office for ETS foreign language reading knowledge examinations in French, German, and Russian on October 28. |
| OCTOBER 6, Friday, 5:00 p.m. | Last time for dropping courses without receiving a grade of E. |
| OCTOBER 20, Friday | Last time for paying degree application fee at the Cashier's Office for a degree to be awarded at the end of the Fall Quarter. |

* *This Calendar may be subject to change. Should subsequent notices be in conflict with the dates listed herein, the latest information should be followed.*

## (FALL QUARTER, 1967—*continued*)

OCTOBER 27, Friday ..... Last day for graduate students to apply to take the foreign language reading knowledge examination in Spanish or the functional knowledge examinations to be administered on November 4.

OCTOBER 28, Saturday, 9:45 a.m. .... ETS foreign language reading knowledge examinations in French, German, and Russian, Leigh 207.

NOVEMBER 3, Friday, 5:00 p.m. ..... Last time for removing grades of I or X received in the preceding term of attendance.

NOVEMBER 3, Friday, 5:00 p.m. ..... Last time for University of Florida undergraduates to file application for Graduate School.

NOVEMBER 4, Saturday, 10:00-12 noon ..... Foreign language reading knowledge examination in Spanish or functional knowledge examinations for graduate students, Walker Auditorium.

NOVEMBER 23-25, Thursday-Saturday ..... Thanksgiving. Classes suspended.

NOVEMBER 27, Monday, 4:00 p.m. .. Last time for candidates for master's and doctor's degrees to be awarded at the end of the quarter to file theses with the Dean of the Graduate School.

DECEMBER 1, Friday, 5:00 p.m. ..... Last time for withdrawing without receiving failing grades in all courses.

DECEMBER 9, Saturday ..... All classes end.

DECEMBER 11, Monday ..... Final examinations begin.

DECEMBER 18, Monday, noon ..... All grades for Fall Quarter due in the Office of the Registrar.

DECEMBER 19, Tuesday, noon ..... Report of Colleges on candidates for degrees due in the Graduate School Office.

## WINTER QUARTER—1968

DECEMBER 4, Monday ..... Last day for those not previously in attendance at the University of Florida to file application for admission for the Winter Quarter. Students whose admissions have not been cleared by December 22 will be assigned late registration appointments.

DECEMBER 22, Friday, 5:00 p.m. .....Last day for those previously in attendance at the University of Florida to apply for registration appointments in the regular registration period. Those who apply or clear after this date will be assigned late registration appointments.

JANUARY 2-3, Tuesday-Wednesday ....Registration according to appointments assigned. No one permitted to start registration after 3:00 p.m. on Wednesday, January 3.

JANUARY 3, Wednesday .....Last time for paying examination fee at the Cashier's Office for ETS foreign language reading knowledge examinations in French, German, and Russian on February 3.

JANUARY 4, Thursday .....Classes begin. Last time for completing registration for Winter Quarter. No one permitted to start registration after 3:00 p.m. on Thursday, January 4. All registration fees increased $25.

JANUARY 9, Tuesday, 5:00 p.m. .....Last time for adding courses and for changing sections.

JANUARY 16, Tuesday, 5:00 p.m. .....Last time for dropping courses without receiving a grade of E.

JANUARY 26, Friday .....Last time for paying degree application fee at the Cashier's Office for a degree to be awarded at the end of the Winter Quarter.

FEBRUARY 2, Friday .....Last day for graduate students to apply to take the foreign language reading knowledge examination in Spanish or the functional knowledge examinations to be administered on February 10.

FEBRUARY 3, Saturday, 9:45 a.m. ....ETS foreign language reading knowledge examinations in French, German, and Russian, Leigh 207.

FEBRUARY 9, Friday, 5:00 p.m. .....Last time for removing grades of I or X received in the preceding term of attendance.

FEBRUARY 9, Friday, 5:00 p.m. .....Last time for University of Florida undergraduates to file application for Graduate School.

FEBRUARY 10, Saturday,
10:00-12 Noon .....Foreign language reading knowledge examination in Spanish or functional knowledge examinations for graduate students, Walker Auditorium.

## (WINTER QUARTER, 1968—*continued*)

FEBRUARY 26, Monday, 4:00 p.m. ....Last time for candidates for master's and doctor's degrees to be awarded at the end of the quarter to file theses with the Dean of the Graduate School.

MARCH 1, Friday, 5:00 p.m. .....Last time for withdrawing without receiving failing grades in all courses.

MARCH 9, Saturday .....All classes end.

MARCH 11, Monday .....Final examinations begin.

MARCH 18, Monday, noon .....All grades for Winter Quarter due in the Office of the Registrar.

MARCH 19, Tuesday .....Last time for paying examination fee at the Cashier's Office for ETS foreign language reading knowledge examinations in French, German, and Russian on April 20.

MARCH 19, Tuesday, noon .....Report of Colleges on candidates for degrees due in the Graduate School Office.

## SPRING QUARTER—1968

FEBRUARY 26, Monday .....Last day for those not previously in attendance at the University of Florida to file application for admission for the Spring Quarter. Students whose admissions have not been cleared by March 13 will be assigned late registration appointments.

MARCH 13, Wednesday, 5:00 p.m. ....Last day for those previously in attendance at the University of Florida to apply for registration appointments in the regular registration period. Those who apply or clear after this date will be assigned late registration appointments.

MARCH 19, Tuesday, 5:00 p.m. .....Last time for University of Florida undergraduates to file application for Graduate School.

MARCH 19, Tuesday .....Last time for paying examination fee at the Cashier's Office for ETS foreign language reading knowledge examinations in French, German, and Russian on April 20.

MARCH 21, Thursday-Saturday .....Registration according to appointments assigned. No one permitted to start registration after 10:00 a.m. on Saturday, March 23.

MARCH 25, Monday ..... Classes begin. Last time for completing registration for Spring Quarter. No one permitted to start registration after 3:00 p.m. on Monday, March 25. All registration fees increased $25.

MARCH 29, Friday, 5:00 p.m. ..... Last time for adding courses and for changing sections.

APRIL 5, Friday, 5:00 p.m. ..... Last time for dropping courses without receiving a grade of E.

APRIL 19, Friday ..... Last time for paying degree application fee at the Cashier's Office for a degree to be awarded at the end of the Spring Quarter.

APRIL 19, Friday ..... Last day for graduate students to apply to take foreign language reading knowledge examination in Spanish or functional knowledge examinations to be administered on April 27.

APRIL 20, Saturday, 9:45 a.m. ..... ETS foreign language reading knowledge examinations in French, German, and Russian, Leigh 207.

APRIL 26, Friday, 5:00 p.m. ..... Last time for students to remove grades of I or X received in preceding term of attendance.

APRIL 27, Saturday, 10:00-12 noon .. Foreign language reading knowledge examination in Spanish or functional knowledge examinations for graduate students, Walker Auditorium.

MAY 20, Monday, 4:00 p.m. ..... Last time for candidates for master's and doctor's degrees to be awarded at the end of the quarter to file theses with the Dean of the Graduate School.

MAY 24, Friday, 5:00 p.m. ..... Last time for withdrawing without receiving failing grades in all courses.

JUNE 1, Saturday ..... All classes end.

JUNE 3, Monday ..... Final examinations begin.

JUNE 9, Sunday ..... Commencement Convocation.
All graduates who have received advanced degrees after April 23, 1967, and all candidates for advanced degrees on June 11, 1967, are invited to take part in the Commencement Convocation. The award of advanced degrees to candidates is subject to completion of all requirements for such degrees.

## (SPRING QUARTER, 1968—*continued*)

| | |
|---|---|
| JUNE 10, Monday, noon | All grades for Spring Quarter due in the Office of the Registrar. |
| JUNE 11, Tuesday, noon | Report of Colleges on candidates for degrees due in Graduate School Office. |

## SUMMER QUARTER—1968

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|---|---|
| MAY 6, Monday | Last day for those not previously in attendance at the University of Florida to file application for admission for the Summer Quarter. Students whose admissions have not been cleared by May 24 will be assigned late registration appointments. |
| MAY 31, Friday, 5:00 p.m. | Last day for those previously in attendance at the University of Florida to apply for registration appointments in the regular registration period. Those who apply or clear after this date will be assigned late registration appointments. |
| JUNE 7-8, Friday-Saturday | Registration according to appointments assigned. No one permitted to start registration after 10:00 a.m. on Saturday, June 8. |
| JUNE 10, Monday | Classes begin. Last time for completing registration for Summer Quarter. No one permitted to start registration after 3:00 p.m. on Monday, June 10. All registration fees increased $25. |
| JUNE 14, Friday, 5:00 p.m. | Last time for adding courses and for changing sections. |
| JUNE 21, Friday, 5:00 p.m. | Last time for dropping courses without receiving a grade of E. |
| JULY 2, Tuesday | Last time for paying examination fee at the Cashier's Office for ETS foreign language reading knowledge examinations in French, German, and Russian on August 3. |
| JULY 5, Friday | Last time for paying degree application fee at the Cashier's Office for a degree to be awarded at the end of the Summer Quarter. |
| JULY 12, Friday, 5:00 p.m. | Last time for University of Florida undergraduates to file application for Graduate School. |

| | |
|---|---|
| JULY 12, Friday | Last day for graduate students to apply to take the foreign language reading knowledge examination in Spanish or functional knowledge examinations to be administered on July 20. |
| JULY 12, Friday, 5:00 p.m. | Last time for students to remove grades of I or X received in preceding term of attendance. |
| JULY 20, Saturday, 10:00-12 noon | Foreign language reading knowledge examination in Spanish or functional knowledge examinations for graduate students, Walker Auditorium. |
| AUGUST 3, Saturday, 9:45 a.m. | ETS foreign language reading knowledge examinations in French, German, and Russian, Leigh 207. |
| AUGUST 5, Monday, 4:00 p.m. | Last time for candidates for master's and doctor's degrees to be awarded at the end of the quarter to file theses with the Dean of the Graduate School. |
| AUGUST 9, Friday, 5:00 p.m. | Last time for withdrawing without receiving failing grades in all courses. |
| AUGUST 17, Saturday | All classes end. |
| AUGUST 19, Monday | Final examinations begin. |
| AUGUST 26, Monday, noon | All grades for Summer Quarter due in the Office of the Registrar. |
| AUGUST 27, Tuesday, noon | Report of Colleges on candidates for degrees due in the Graduate School Office. |

# *General Information*

## THE GRADUATE SCHOOL

THE GRADUATE SCHOOL consists of the dean, the assistant deans, the Graduate Council, and the graduate faculty. General policies and standards of the Graduate School shall be established by the graduate faculty. The Graduate School is responsible for the enforcement of minimum general standards of graduate work in the University and for the coordination of the graduate programs of the various colleges and divisions of the University. The responsibility for the detailed operations of graduate programs is vested in the individual colleges, divisions, and departments. In most of the colleges an assistant dean or other official is directly responsible for graduate study in his college.

The Graduate Council, of which the dean is chairman, shall assist him in being the agent of the graduate faculty for execution of policy related to graduate study and associated research. The Council considers petitions and recommends the award of graduate degrees. Members of the graduate faculty are appointed by the dean with the approval of the Graduate Council on the basis of specific needs and qualifications to meet the needs. Thus members of the graduate faculty fall into three categories in accordance with their function: those who are appointed to teach graduate courses, those appointed to direct the master's theses, and those appointed to direct doctoral dissertations. No staff member is expected to perform any of these functions without having been appointed to the graduate faculty, though temporary exceptions may be made in unusual circumstances. Membership on the graduate faculty is based upon departmental need and ability to carry out certain responsibilities relative to the instruction of graduate students, but nonmembership does not imply the lack of such ability.

Study leading to graduate degrees has existed at the University of Florida from the date of the establishment of the University on its present campus. The first M.A. was awarded in 1906, the major being English, and the first M.S. in 1908, with major in entomology. The first programs leading to the Ph.D. were intiated in 1930, and the first degrees were awarded in 1934, one with major in chemistry and the other with major in pharmacy. The first Ed.D. was awarded in 1948. Graduate study has had a phenomenal growth at the University of Florida. In 1920 two degrees were awarded in two fields. In 1930, 33 degrees were awarded in 12 fields. In 1940, 66 degrees were awarded in 16 fields. In 1965-66 the total number of degrees awarded was 979 in 80 fields. The proportion of doctor's degrees has increased steadily. In 1950, 18 Ph.D.'s and 5 Ed.D.'s were awarded. In 1965-66 the totals were 141 Ph.D.'s and 30 Ed.D.'s

In the beginning the organization of graduate study was very informal. Control was in the hands of a faculty committee which reported directly to the President. In 1910, however, James N. Anderson, head of the Department of Ancient Languages, was appointed Dean of the College of Arts and Sciences and Director of Graduate Work, and in 1930 he became the first dean of the Graduate School. He was succeeded upon his retirement in 1938 by T. M. Simpson, head of the Department of Mathematics, who held the position until he became dean emeritus in 1951. C. F. Byers, head of the Department of Biological Sciences in the University College, served as acting dean from June 1951 until August 1952, when he was succeeded by the present dean, L. E. Grinter, who came to Florida from the Illinois Institute of Technology, where he had served as Vice President, Dean of the Graduate School, and Research Professor.

# GRADUATE PROGRAMS

## NON-THESIS DEGREES

MASTER OF AGRICULTURE, with major in any field in agriculture

MASTER OF BUSINESS ADMINISTRATION, with major in any field in business administration and in health and hospital administration

MASTER OF EDUCATION, with major in any field in education, including business education

MASTER OF ENGINEERING

MASTER OF NURSING

MASTER OF PHYSICAL EDUCATION AND HEALTH, with major in physical education

MASTER OF REHABILITATION COUNSELING

MASTER OF STATISTICS

MASTER OF ARTS IN TEACHING, with major in appropriate departments in the various colleges

MASTER OF SCIENCE IN TEACHING, with major in appropriate departments in the various colleges

SPECIALIST IN EDUCATION—a special degree requiring one year of graduate work beyond the master's degree

## THESIS DEGREES

MASTER OF SCIENCE IN AGRICULTURE, with major in one of the following:

- Agricultural Economics
- Agricultural Education
- Agronomy
- Animal Science
- Dairy Science
- Entomology
- Food Science
- Fruit Crops
- Ornamental Horticulture
- Plant Pathology
- Poultry Science
- Soils
- Vegetable Crops

MASTER OF SCIENCE IN BUILDING CONSTRUCTION

MASTER OF SCIENCE IN ENGINEERING, with major in one of the following:

- Aerospace Engineering
- Agricultural Engineering
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Engineering Science and Mechanics

Environmental Engineering Sciences
Industrial and Systems Engineering
Mechanical Engineering
Metallurgical Engineering
Nuclear Engineering Sciences

MASTER OF SCIENCE IN FORESTRY

MASTER OF SCIENCE IN STATISTICS

MASTER OF SCIENCE IN PHARMACY, with major in one of the following:
Pharmaceutical Chemistry
Pharmacognosy
Pharmacy

MASTER OF SCIENCE, with major in one of the following:
Bacteriology
Biochemistry
Botany
Chemistry
Entomology
Geography
Geology
Mathematics
Pathology
Physics
Plant Pathology
Psychology
Radiation Biophysics
Veterinary Science
Zoology

MASTER OF FINE ARTS

MASTER OF ARTS IN ARCHITECTURE, with major in one of the following:
Architectural Design
Building Construction

MASTER OF ARTS IN EDUCATION, with major in one of the following:
Agricultural Education
Business Education
Educational Administration
Elementary Education
Foundations of Education
Personnel Services
Secondary Education

MASTER OF ARTS IN JOURNALISM AND COMMUNICATIONS

MASTER OF ARTS IN PHYSICAL EDUCATION AND HEALTH

MASTER OF ARTS, with major in one of the following:
Accounting
Anthropology
Economics
English
Finance and Insurance
French
Geography
German
History
Latin
Latin American Area Studies
Management and Business Law
Marketing
Mathematics
Philosophy
Political Science
Psychology
Real Estate
Sociology
Spanish
Speech

DOCTOR OF EDUCATION, with major in one of the following:
Curriculum and Instruction
Educational Administration
Foundations of Education
Personnel Services

DOCTOR OF PHILOSOPHY, with major in one of the following:
Aerospace Engineering
Agricultural Economics
Agronomy
Animal Science
Bacteriology
Biochemistry
Botany
Chemical Engineering
Chemistry
Civil Engineering

Economics
Economics and Business Administration
Electrical Engineering
Engineering Science and Mechanics
English
Entomology
Environmental Engineering Sciences
French
Fruit Crops
Geography
History
Mathematics
Mechanical Engineering
Medical Sciences, including
  Anatomy
  Biochemistry
  Microbiology
  Pathology
  Pharmacology
  Physiology
Metallurgical Engineering
Nuclear Engineering Sciences
Pharmaceutical Chemistry
Pharmacognosy
Pharmacy
Physics
Plant Pathology
Political Science, including
  International Relations
Psychology
Sociology
Soils
Spanish
Speech
Systems Engineering (Operations Research)
Vegetable Crops
Zoology

# ADMISSION TO THE GRADUATE SCHOOL

APPLICATION FOR ADMISSION to the Graduate School must be made to the Director of Admissions on forms supplied by his office and at times stipulated in the *University Calendar*. Applications which meet minimum standards for admissions are referred by the Director to the graduate selection committees of the various colleges and divisions for approval or disapproval.

No application will be considered unless the complete official transcripts of all the applicant's undergraduate and graduate work are in the possession of the Registrar, and no transcript will be accepted as official unless it is received directly from the Registrar of the institution in which the work was done. Official supplementary transcripts are required, as soon as they are available, for any work completed after making application.

In general, no student who is a graduate of a nonaccredited institution will be considered for graduate study in any unit of the University.

## ADMISSION REQUIREMENTS

UNDERGRADUATE RECORD—Unqualified admission to the Graduate School is commonly dependent upon the presentation of a baccalaureate degree from an accredited college or curriculum with an average grade of B for the junior and senior years. In some units of the Graduate School and on the more advanced levels of graduate study, an undergraduate average considerably above B may be required. In some units (see the following two paragraphs) admission may be considered with an undergraduate average somewhat below B. College graduate admission selection committees take into account not only the general grade average, but the distribution of work and the quality and extent of preparation for the graduate program the student proposes to undertake.

The minimum undergraduate grade average acceptable for admission to programs leading to the degrees of Master of Arts in Education, Master of Education, Master of Arts in Physical Education and Health, and Master of Physical Education and Health is 2.5, calculated on a basis of 4.0 as the highest possible average and covering the last two years of undergraduate work (at least 90 credits).

In the College of Agriculture, admission to graduate study is normally limited to those students who have maintained at least a 2.75 grade-point average in their upper-division work and 3.0 in their major subject. For students with an undergraduate major in general agriculture, the minimum upper-division average is 2.85. In exceptional cases, where a candidate has demonstrated in some other way his fitness to do graduate work, as, for instance, outstanding achievement since earning the bachelor's degree, he may be considered for admission.

While the general admissions requirements described above apply to both master's and doctoral candidates, it should be noted that doctoral candidates must meet certain additional requirements which vary according to the programs established by the departments and colleges. Furthermore, it is desirable for students planning to enter certain colleges and departments to have a reading knowledge of at least one foreign language.

## ADMISSION TO THE GRADUATE ENGINEERING EDUCATION SYSTEM (GENESYS)

The Graduate Engineering Education System (GENESYS) is a part of the College of Engineering and as such follows the regular *University Calendar.* Applications can be accepted as late as the final date listed in the *University Calendar;* however since the records of all applicants for GENESYS must be reviewed by the College of Engineering and time is required to assemble the necessary transcripts and test scores, it is strongly urged that application be made well in advance of the final date.

All applicants seeking to enroll for credit in courses through GENESYS must secure admission to the University of Florida. Application for admission must be made to the Admissions Section, Office of the Registrar, University of Florida, on forms obtained from the Resident Director of GENESYS at Cape Kennedy, Orlando, or Daytona Beach. No application will be considered unless complete official transcripts of all the applicant's undergraduate and graduate work are in the possession of the Registrar and no transcript will be accepted as official unless it is received directly from the Registrar of the institution in which the work was done.

Applicants for GENESYS may be admitted initially to the Graduate School, or to the College of Engineering as postgraduate students, depending upon the applicant's qualifications and objectives. In order to be admitted to the Graduate School the GENESYS applicant must satisfy all admission requirements established by the Graduate School. Briefly stated these requirements include the presentation of a baccalaureate degree in engineering or science from an accredited college or curriculum with an average grade of B

for the junior and senior years; a satisfactory score on the Graduate Record Examinations; and the recommendation of the Graduate Selection Committee of the College of Engineering.

Applicants for GENESYS who do not fully meet the requirements for admission to the Graduate School or who do not desire to work for a graduate degree may be admitted to the College of Engineering as postgraduate students. Such students may subsequently be admitted to the Graduate School by removing deficiencies, if any, in their qualifications. Applications will be considered individually on the basis of the applicant's overall record. The basic requirement for admission to GENESYS as a postgraduate student in the College of Engineering is the possession of the baccalaureate degree in engineering or science from an accredited college or curriculum. Although test scores from the Graduate Record Examinations are not required, applicants are strongly advised to submit scores on both the aptitude test and the advanced test in engineering of the GRE as evidence of their qualification for admission. Satisfactory scores on the GRE will be required for subsequent admission to the Graduate School.

## ADMISSION PROCEDURES FOR FOREIGN STUDENTS

All foreign students whose native tongue is not English making application for admission to the Graduate School of the University of Florida must present their scores on TOEFL (Testing of English as a Foreign Language). Each applicant is asked to write TOEFL, Educational Testing Service, Princeton, New Jersey, U.S.A., requesting a Bulletin of Information and registration form. It is important to remember that final consideration *cannot* be granted a foreign student's application for admission until his scores on this test are received by: Admission Section, Office of the Registrar, University of Florida, Gainesville, Florida, 32601, U. S. A.

GRADUATE RECORD EXAMINATION REQUIREMENT.—*All* students are required to submit satisfactory scores on the Graduate Record Examination for admission to the Graduate School. However, students educated in foreign countries who apply for admission while residing outside the United States may be given a postponement of this requirement until the first quarter of attendance at the University of Florida. Permission to register for a second quarter will depend upon completion of the examination.

## GRADUATE RECORD EXAMINATION

A satisfactory average score on the Graduate Record Examination is required for admission. Each applicant for admission must submit scores on the aptitude test of the GRE, but either at the request of the department concerned or on his own volition, the applicant is encouraged to submit in addition the score on one or more advanced subject matter tests of the GRE. The scores on all tests taken will be weighed in regard to admission.

The GRE is given six times a year—in October, December, January, February, April, and July—at a great many locations in the United States,

including Gainesville, Florida. To determine exact dates and the most convenient locations, students should write to the Educational Testing Service, Princeton, New Jersey. Applications are required several weeks prior to the examination, and scores are received about a month after the examination. Hence, it is necessary to apply for the GRE in early September for admission in January, in early January for admission in March, and in early March for admission in September. Other examinations are given in early February and early July but the ones listed above are correlated with admissions deadlines.

Students enrolled in the Graduate School prior to establishment of the GRE requirement for admission (June, 1956) are permitted to complete the degree on which they were working. However, if the student has not been registered for graduate work at the University for seven years, or if he wishes to work toward a second graduate degree, he must submit satisfactory GRE scores before readmission.

POSTPONEMENT OF THE GRE.—If a student applies for admission too late to take the GRE before his expected date of entry, particularly for a summer session, he may apply for admission to the Graduate School with postponement of the GRE and submit his score on the Miller Analogies Test to be used as a partial basis for deciding whether tentative admission may be granted. It should be noted, however, that the Miller Analogies Test is not a substitute for the GRE. In cases where the GRE has been postponed it must be taken with satisfactory results before a second registration will be permitted.

THE MILLER ANALOGIES TEST is given at about 250 colleges and universities throughout the country, and is administered by the University Counseling Center, Winston W. Little Hall, Room 311, throughout the calendar year at 3:00 P.M. on Monday, Wednesday, and Thursday. During the week prior to the first day of classes the test will also be offered at 10:00 A.M. on Monday and 3:00 P.M. on Tuesday and Friday. Special appointments can be made by contacting the Counseling Center. The cost of the test, $3.00, should be paid to the University Cashier, Student Service Center, and the receipt should be presented at the time of testing.

Test scores should be presented to the Dean of the Graduate School. No student can be considered for postponement of the GRE until after his application for admission is complete and all his credentials have been received in the Office of the Registrar.

ADMISSION TEST FOR GRADUATE STUDY IN BUSINESS.—Students applying for admission to the Graduate School who wish to pursue degrees in the College of Business Administration may submit satisfactory scores on the Admission Test for Graduate Study in Business (ATGSB) as a substitute for the required scores on the Aptitude portion of the Graduate Record Examination.

The Admission Test for Graduate Study in Business (ATGSB) is given five years a year—in November, February, April, July, and August—at a great many locations in the United States, including Gainesville, Florida. To determine exact dates and the most convenient locations, students should write to the Educational Testing Service, Princeton, New Jersey.

## TRIAL PROGRAMS

The Graduate School approves two types of trial programs under the fifth-year undergraduate registration for applicants whose admission for graduate study is in doubt. These programs are arranged by the major department when the student has been referred to it for this purpose by the Registrar. Trial programs shall be strictly reserved for genuinely problematical or borderline cases.

TYPE I (partly transferable): a program of about 18 quarter credits consisting of advanced undergraduate courses and no more than 6 credits of graduate courses. Upon completion of the program with an average of B or better, up to 15 of 18 credits may be transferred to the student's graduate record, provided that this transfer is approved by his major department, his college, and the Graduate School, and that all other requirements for admission to the Graduate School have been met.

Programs of Type I are used where a student's previous grade record or GRE scores are on the borderline of acceptability.

TYPE II (nontransferable): a program of 18 or more credits of undergraduate work, none of which may be transferred to the student's graduate record.

Programs of Type II are used (1) to validate undergraduate records from nonaccredited and unevaluated colleges; (2) in cases where the quantity or quality of the student's preparation cannot be determined with sufficient certainty for judging admission; (3) to repair extensive deficiences in undergraduate programs which do not meet the prerequisites for graduate study laid down by the student's proposed major department (minor deficiencies of less than 18 credits and change of field requirements covered by this *Catalog* may be handled on a non-credit basis as part of the graduate program for students who meet admission standards).

Trial programs will be limited to two quarters' duration. If the trial program of either type is completed with an average grade of A or B and other admission requirements have been met, the student will, upon recommendation of his major department and college, be given unqualified admission to the Graduate School. To secure this change of status, the student should apply through his department chairman and college dean to the Registrar.

All trial programs must be formally approved by the major department and college and filed with the Registrar and the Graduate School in order that there may be no question in either office concerning the termination of the program or of the courses to be used in calculating the grade average. Neither type of trial program may be extended without preapproval of the Graduate Dean.

## ADMISSION TO A SECOND GRADUATE PROGRAM

A student who has completed a degree program in the Graduate School may not undertake an additional degree program without the approval of the chairman of the department in which he proposes to do his major work. GRE scores must be submitted by the student at the time he proposes an additional

degree program even though they were not required at the time he started his previous degree work. It is particularly important that these scores and the other elements in the record and qualifications of the student be carefully weighed before he is permitted to undertake work for the doctor's degree.

### UNDERGRADUATE REGISTRATION IN GRADUATE COURSES

An undergraduate student at the University of Florida is not eligible to enroll in graduate courses at the 600 and 700 levels unless the student has less than two quarters of course work to complete for the baccalaureate degree. In this case, he may, prior to registering, request in writing, through the dean of his college, approval by the Dean of the Graduate School of course registration eligible for later use toward a graduate degree. Such approval can be given only to students who have maintained a B average in the upper division and whose total proposed program does not exceed 15 credits in a single quarter. If the courses are to be applied toward a graduate degree at the University of Florida, this also must be approved at this time. Approval of an advanced undergraduate course will be restricted to one not normally a prerequisite to the graduate studies to be undertaken. For application to a specific advanced degree the course work taken must be earned with a grade of A or B with all course work for the quarter or two quarters at B average, and be recommended for transfer to the student's graduate record by his supervisory committee after he has been admitted to the Graduate School. Courses beyond the requirement of the bachelor's degree which are taken without such approval are not eligible for transfer as graduate credit. Foundation work required for a change of major must be taken without graduate credit. Students enrolled in the three-year master's degree program will be permitted to register in graduate courses when approved by the program advisory committee and the assistant dean of the Graduate School in charge of the program.

### ADMISSION OF FACULTY MEMBERS AS GRADUATE STUDENTS

Members of the faculty of the University of Florida with a rank of assistant professor or above (or equivalent), except county agents in the Agricultural Extension Service, may not receive a graduate degree from this institution. They may, however, register for work in the Graduate School and apply the credit earned to graduate degrees to be conferred by other institutions.

## GENERAL REGULATIONS AND INSTRUCTIONS

### STUDENT RESPONSIBILITY

It is the responsibility of the student to inform himself concerning, and to observe, all regulations and procedures required by the course he is pursuing. *In no case will a regulation be waived or an exception granted because a student pleads ignorance* of the regulation or asserts that he was not informed of it by his adviser or other authority. The student should make himself especially familiar with (1) this section of the *Catalog,* (2) the section pre-

senting the requirements for the degree he plans to take, and (3) the offerings and requirements of his major department.

CONSULTATION WITH COLLEGE AND DEPARTMENT.—After the student has been admitted to the Graduate School but before his first registration, he should consult the college and department in which he will do his work concerning course requirements, deficiencies if any, the planning of a program, special regulations, etc. Departments may have degree requirements that are not listed in this *Catalog*. All registrations require the signature of the dean of the college (or his representative) in which the degree is to be awarded.

## LOADS

The University of Florida will adopt, beginning in September of 1967, a quarter system of operation consisting of four 10-week periods of instruction and examination. Class schedules have been revised so that a credit under the quarter system is equal to $\frac{2}{3}$ of a semester credit.

MAXIMUM REGISTRATION.—The maximum graduate registration permitted in any quarter is 15 credits. (Where 4- or 5-credit courses are included in registration, a 16-credit load is acceptable.) Part-time employment of any kind, either within or without the University, reduces the maximum study load as indicated by the following table:

| Fraction of Time Employed | Maximum Hours Per Week Employed | Maximum Quarter Credits Allowed | Residence Acquired |
|---|---|---|---|
| none | none | 15 | 1 quarter |
| $\frac{1}{3}$-time | 15 | 12 | $\frac{4}{5}$ quarter |
| $\frac{1}{2}$-time | 20 | 10 | $\frac{2}{3}$ quarter |
| $\frac{3}{4}$-time | 30 | 7 | $\frac{1}{2}$ quarter |
| fully employed | 40 | 4 credits course work plus 2 credits of thesis research | $\frac{2}{5}$ quarter |

MINIMUM REGISTRATION.—Holders of fellowships or assistantships and part-time interim instructors who are working for a graduate degree must register for graduate study programs commensurate with the study time permitted by their awards, and in no case for less than 6 credits per quarter.

VETERAN'S CERTIFICATION.—Students who are applying for assistance under the Veterans' Readjustment Benefits Act of 1966 (Public Law 89-358), and whose applications are otherwise acceptable to the Veterans Administration, will automatically be certified by the Registrar as follows:

| Quarter Certification | Registration |
|---|---|
| full | 14-15 credits |
| $\frac{3}{4}$ | 10-13 credits |
| $\frac{1}{2}$ | 7- 9 credits |
| fees only | 3- 6 credits |

Students who desire higher certification must submit through the Graduate School office the form "Certification of Study Load." The University Housing Office also requires this form for students with less than a full-time load (as

defined by his college or school). Appropriate allowance in "equivalent credits" may be made on this form for preparation for language examinations or qualifying examinations, or for other studies specifically required by the student's supervisory committee. Certification will be on the basis of the following proportion:

| Certification | Minimum Study Load | Maximum Employment |
|---|---|---|
| full | 12 credits | 15 hrs. per week (⅓-time) |
| ¾ | 9 credits | 20 hrs. per week (½-time) |
| ½ | 6 credits | 30 hrs. per week (¾-time) |
| fees only | 3 credits | full-time employee |

Where the supervisory committee classifies the work load as a contribution to the student's approved educational program, additional certification will normally be approved.

## RESIDENCE

Residence at the University of Florida is determined on a quarter basis. The University of Florida will grant residence credit of three quarters of full time registration for an academic year of work done at another institution. Specific residence requirements of doctoral degrees will be found in the section of this *Catalog* dealing with the Ph.D. degree.

## COURSES AND CREDITS

Courses numbered 500-599 are for fifth-year or other advanced undergraduate programs. Regulations as to the use of these courses in graduate programs, grading, and minimum class size will be the same as for courses in the 400 category. Courses numbered 600 and above are limited to graduate students. Courses numbered 700 and above are graduate courses primarily for advanced graduate students.

Undergraduate courses numbered 300 and above are acceptable for minor credit when taken as a part of an approved graduate program. Courses bearing numbers below 600 may not be used for graduate major credit unless they have been approved for this purpose by the Graduate Council. In any case, at least 50 per cent of the minimum course work for any master's degree must be in courses numbered 600 or above.

Registration in the course numbered 699, Master's Research, may be from 0 to 9 credits, and in the course numbered 799, Doctoral Research, may be from 1 to 12 credits in one quarter. The total registration in 699 is limited to 24 credits. Advisers should assign to registration in these courses the number of credits appropriate to the planned work in research. Registration for zero credit should be assigned only in exceptional situations, since the registration should normally reflect the proposed program of research as well as course work. On the assignment of credit for research which is a part of a student's employment, as well as a contribution to his thesis or dissertation, see the section on *Residence* for the Ph.D. degree.

A complete list of approved graduate courses appears in the section of this

*Catalog* entitled *Departmental Courses.* Departments reserve the right to decide which of these graduate courses shall be given in any quarter. The published *Schedule of Courses* does not always include all graduate courses offered; the departments, therefore, should be consulted concerning available courses.

CORRESPONDENCE AND EXTENSION WORK.—No courses may be taken for graduate credit by correspondence. No extension courses may be used for graduate credit except in programs for the M.Ag., M.Ed., M.A.E., M.P.H., and Ed.S. For regulations governing the use of such courses in the degree programs named, see below, under requirements for specific degrees, the limits on off-campus work. Extension work taken at another institution (except through the Board of Regents Office for Continuing Education) may not be transferred to the University of Florida for graduate credit.

STATE CENTERS FOR CONTINUING EDUCATION.—Course work is available in the graduate residence centers established in the state. Degree programs to which residence center work may be applied are Master of Agriculture, Master of Education, Master of Engineering, Master of Business Administration and, Master of Physical Education and Health. The amount of credit acceptable for transfer to a degree program varies according to the degree sought. For regulations governing the use of residence center work in the degree programs named, see below, under requirements for specific degrees.

## GRADES

Passing grades for graduate students are A, B, and C. Grades of C in courses below 600-level are acceptable for credit toward graduate degrees only if the total program meets the B-average requirement. C grades in 600- and 700-level courses count toward a graduate degree only if an equal number of credits in courses numbered 600 or above have been earned with a grade of A.

Admission to candidacy for a graduate degree and the award of such degrees depend (among other requirements) upon maintenance of an average grade of B for all work attempted in the major and minor fields. Any grade of I (incomplete) in the fields of the major and minor (or minors) must be removed by completing all required work, unless a grade point average of 3.0 is maintained, including incomplete courses. Grades in courses numbered 699 and 799 are not considered in calculating these averages.

It is the responsibility of the thesis or dissertation director to submit a grade in 699 or 799. The grade may be any of the standard letter grades or it may be I. If the grade of I is recorded, it should be changed to a regular letter grade as soon as the student has completed the work appropriate to the credits of registration in 699 or 799 and no later than the completion of the thesis or dissertation.

UNSATISFACTORY SCHOLARSHIP.—Any graduate student may be denied further registration in the University or in his graduate major if his progress toward the completion of his planned program becomes unsatisfactory. Unsatisfactory progress has been defined by the Graduate Council as failure to maintain an accumulative grade average of B in *all work attempted* in the Graduate School.

## CHANGE OF MAJOR

Graduate students already admitted for work in one department who wish to transfer to another department within the same college, or students who wish to change from one college to another, must make formal application through the Office of the Registrar.

## FOREIGN LANGUAGE EXAMINATIONS

In those degree programs where a foreign language examination is required, the following principles and procedures apply:

Each candidate, at the time of applying for a foreign language reading knowledge examination in Spanish or a functional knowledge examination, shall present a certificate of admission to the Department of Foreign Languages. This certificate shall bear the signature of his supervisory chairman or departmental adviser and shall state that he is believed to be prepared for the examination.

If he fails to pass a foreign language reading knowledge examination in Spanish or a functional knowledge examination, the student shall present to the Graduate School, through his supervisory committee chairman, acceptable evidence that he has made a serious attempt to prepare himself for re-examination. If the evidence is acceptable, the student will be given a certificate of admission to a second examination.

Those students wishing to be certified as proficient in a reading knowledge of French, German, or Russian will take the Graduate School Foreign Language Tests administered by the Educational Testing Service (ETS) and given four times a year on the University of Florida campus. Since the ETS examinations are nationally administered, the Graduate School will accept scores from the examinations taken at any other authorized location in the United States.

Students apply for these examinations by paying an examination fee of $6.25 to the University Cashier and then presenting a receipt to the Graduate School Office in exchange for an admission ticket to the examination.

Each of the ETS examinations requires 80 minutes and consists of two separately timed parts. Designed to gauge mastery of the basic vocabulary and structure of the languages, Section I contains 40 multiple-choice questions cast in the foreign language of the test and requires 40 minutes of working time. Section II of the test consists of four alternate parts, each a sample of the literature of one of the following broad fields: biological sciences, humanities, physical sciences, or social sciences. The student selects one of the four fields and answers questions cast in English to reveal his understanding of the passage. No dictionaries are allowed. Foreign language examinations other than those covered by the ETS will be given by the Foreign Language Department. Information may be obtained at the office of the Graduate School. For testing dates, see the *University Calendar* in this *Catalog*.

## PROCEDURE FOR FINAL QUARTER

It is essential that the student inform himself concerning deadline dates as set forth in the *University Calendar* and in the announcements issued by

the Dean of the Graduate School and by the officials of the student's college, school, or department.

Early in the last term the student should make formal application to the Registrar for his degree. When his thesis is ready to be put in final form he should get instructions from the office of the Dean of the Graduate School.

Normally, students in the Graduate School must be registered in the University at the time they receive a degree. If, however, a student has completed all requirements for his degree, including courses, residence, thesis or dissertation, and all examinations, at the time of registration for the term in which his degree is to be awarded, the Graduate Council will consider a petition to waive this regulation. *In brief, a student must be registered for the term in which his final examination is given.*

### ATTENDANCE AT COMMENCEMENT

Only one commencement ceremony is scheduled annually. Graduates who are to receive advanced degrees are urged to attend Commencement in order to accept personally the honor indicated by the appropriate hood. The student must arrange through the University Bookstore for proper academic costume to be worn at Commencement.

Diplomas will be given at the end of each quarter, and hoods will be mailed immediately after Commencement to advanced degree graduates who were unable to attend.

## REQUIREMENTS FOR MASTER'S DEGREES

### GENERAL REGULATIONS

COURSE REQUIREMENTS.—At least fifty per cent of the minimum course requirement for all master's degrees must be 600-level or above,

RESIDENCE.—For any master's degree the student in residence must spend at least three full-time quarters, or equivalent, as a graduate student at the University of Florida.

Nonresident county agents in the Agricultural Extension Service may use three three-week summer sessions for the purpose of satisfying the residence requirements for the degrees Master of Agriculture or Master of Science in Agriculture, but only if they have also spent one quarter in full-time resident graduate study on the campus at the University of Florida.

COMPREHENSIVE EXAMINATION.—A comprehensive examination either oral or written or both, shall be passed by the candidate. (For the M.Ed. degree see below for special requirement.) This examination will cover at least the candidate's field of concentration, and in no case may it be scheduled earlier than six months before the degree is to be conferred.

ADMISSION TO CANDIDACY.—Admission to candidacy for the master's degree shall take place when approximately one-half of the required course work is completed and not later than two quarters prior to the date of completion of requirements for the degree. The Graduate Council reserves the right to deny degrees to persons who have failed to comply with this regulation at the proper time. Attention of students is directed to the fact that admission

to candidacy is not automatic. It requires a formal application distinct from registration. The student must have a B average for all graduate work completed in order to be admitted to candidacy.

TRANSFERS OF CREDITS.—Courses of full graduate level to the extent of 9 quarter credits may be transferred from an institution approved for this purpose by the Graduate School. Acceptance of transfer credit requires approval of the student's supervisory committee and the Graduate Council. Nonresident or extension work taken at another institution (with the exception of work taken through the Board of Regents Office for Continuing Education) may *not* be transferred to the University of Florida for graduate credit.

TIME LIMIT.—All work for the master's degree must be completed within seven years from the time of first registration.

## MASTER'S DEGREES WITHOUT THESIS

### MASTER OF AGRICULTURE

The degree of Master of Agriculture is designed for those students who wish additional training before entering business occupations or professions, rather than for those interested primarily in research. The basic requirements, including those for admission, residence, supervisory committee, plan of study, and admission to candidacy, are the same as for the Master of Science in Agriculture degree, as outlined elsewhere, but the work requirements are made to conform to the specific objectives of this degree.

WORK REQUIRED.—A minimum of 50 credits of course work is required, at least 25 of which shall be designated strictly for graduates; if a departmental major is claimed, 18 of these 25 credits must be in the major department. Each student's program is designed to take into account the qualifications and needs of the individual and is subject to the approval of the supervisory committee. A thesis is not required, but the student must submit reports, term papers, and records of work accomplished. A *comprehensive written qualifying examination,* given by the supervisory committee, is required before the beginning of the final quarter of work. Failure to qualify in this examination will require either the student's elimination from the program or additional course work. *A final oral examination* by the supervisory committee covering the whole field of study of the candidate is required.

LIMITS ON OFF-CAMPUS WORK.—Credit for courses taken through the State Centers for Continuing Education as applied to the degree of Master of Agriculture is limited to 25 credits. Credit in extension courses (limited to 8 credits) from the University of Florida and Florida State University and credit transferred from another accredited institution reduces proportionately the credit accepted from the graduate residence centers.

For further details, inquire of the Dean of the College of Agriculture.

### MASTER OF ARTS AND MASTER OF SCIENCE IN TEACHING

These degrees are designed for graduate students majoring in departments of the various colleges of the University who intend to teach in junior or four-year colleges. Requirements for admission are the same as for the regular

M.A. and M.S. degrees in the various colleges, and, like the work for those degrees, programs leading to the M.A.T. and the M.S.T. may with proper approval be incorporated into programs leading to the Ph.D.

The requirements for the degrees are as follows:

1. A reading knowledge of one foreign language.
2. Satisfactory completion of at least 54 credits of work while registered as a graduate student, at least 50 per cent of which credits shall be 600-level or above, this work to be distributed as follows:
   a. At least 27 credits in the major and 9 credits in a minor.
   b. Nine credits in a departmental internship in teaching. Three years of successful teaching experience may be substituted for the internship requirement.
   c. At least three courses which may be used as the minor, in educational psychology, sociology (education or community) and curriculum dealing with the junior college. If any or all of these courses have been satisfactorily completed before the program is begun, the credits thus made available may be used for further work in the major, the minor, or in education.
3. A final comprehensive examination, either oral or written or both, shall be passed by the candidate. This examination will cover at least the candidate's field of concentration.

### The Master of Business Administration Degree

The requirements for the Master of Business Administration degree have been designed to give the student broad general preparation for managerial work with emphasis upon developing his capacities and skills for business decision-making. A limited amount of specialization in one field is also required.

This degree is awarded upon the completion of a foundation program of 8 courses and a graduate program of 51 credits. The foundation program may be satisfied in whole or in part by appropriate undergraduate courses. A student having an undergraduate degree in business administration will normally need only 51 credits for the degree. He can, therefore, complete the requirements for the degree in a calendar year.

Foundation Program.—The foundation program must include a minimum of 8 courses as follows:

| | |
|---|---|
| Economic Principles | 2 courses |
| Accounting | 1 course |
| Quantitative methods/statistics | 1 course |
| Business Law | 1 course |
| Business Finance | 1 course |
| Management | 1 course |
| Marketing | 1 course |

(The accounting requirement may be met with ATG 590—Survey of Accounting—(5 credits) or equivalent. If the student presents the usual two-term introductory accounting course, the foundation program will total a minimum of 9 courses.)

THE GRADUATE PROGRAM.—Each candidate for the M.B.A. will take the following courses:

| | |
|---|---|
| BS 679—Business Policy | 4 credits |
| BS 690—Business Research and Reports | 2 credits |
| BS 691—Business Research and Reports | 2 credits |
| ES 615—Economics of Business Decisions | 5 credits |
| ES 616—Economic Environment of Business | 4 credits |

The following courses are required of each candidate unless waived because of adequate course work (graduate or undergraduate) taken in the same area:

| | |
|---|---|
| BS 610—Managerial Accounting | 4 credits |
| BS 664—Managerial Statistics | 4 credits |
| BS 671—Human Relations in Business | 4 credits |
| MGT 570—Production Management Problems | 5 credits |

A candidate whose undergraduate work in quantitative methods is not sufficient to meet the level of competence in this area necessary for effective work in some of the required courses will be required to remedy this deficiency. At least 5 credits taken for this purpose may be counted for graduate credit.

CONCENTRATION.—Each candidate will select one field of concentration from the following: Accounting, Finance, Foreign Trade, Health and Hospital Administration, Insurance, Management, Marketing, Quantitative Analysis for Business, Real Estate and Urban Land Studies, and Transportation.

In all areas except Health and Hospital Administration, the concentration consists of a minimum of 18 credits in approved courses. Of these 18 credits, at least 9 must be completed as a part of the graduate program and must be in courses approved for graduate major credit. Wherever feasible at least one 4-credit course on the 600 level should be included in the concentration. A maximum of 9 credits in the concentration may have been completed for undergraduate credit or as a part of the foundation program. The required basic courses in accounting may not be used as a part of the concentration in accounting. The required basic courses in business finance, marketing, and production management may be used as a part of the concentration in each of these fields.

ELECTIVES.—Any elective courses will be selected from approved courses offered by the College of Business Administration.

CONCENTRATION IN HEALTH AND HOSPITAL ADMINISTRATION.—The Master of Business Administration degree with a concentration in Health and Hospital Administration is offered by the College of Business Administration. The course work in the area of concentration is offered by the College of Health Related Professions, College of Law, and College of Engineering.

In addition to meeting the usual requirements for admission to the Graduate School, students who expect to enroll in this concentration must communicate directly with the Chairman of the Program in Health and Hospital Administration who will arrange for a personal interview with the applicant.

Since 22 credits are required for this concentration, certain courses normally required may be waived when necessary to allow the student to complete the

graduate program with 51 credits. Foundation course requirements are the same for this concentration as for all others. The following courses are required for this concentration:

| | |
|---|---|
| HA 600—Perspectives in Health | 4 credits |
| HA 601—Hospital Organization, the Community and Patient Care | 3 credits |
| HA 602—Financial Administration of Health and Hospital Care | 3 credits |
| HA 610—Seminar in Health and Hospital Administration | 4 credits |
| HA 611—Seminar in Health and Hospital Administration | 2 credits |
| IG 698—Special Problems | 4 credits |
| LW 696—Hospital and Health Law Seminar | 2 credits |

An administrative residency of three quarters is required of all candidates in this concentration.

Comprehensive Examination.—In the latter part of the term in which the candidate expects to complete his course work, he will take his final comprehensive written and oral examination covering his entire program. Examinations for all M.B.A. degrees, including the Health and Hospital Administration concentration, are administered by an examining committee appointed from the graduate faculty of the College of Business Administration.

## Master of Education

Purpose.—This degree is designed to meet the need for professional personnel to serve the variety of functions required in established and emerging educational activities of modern society.

Description.—The minimum requirement for the M.Ed. degree is 50 credits in courses numbered 300 and above, with at least 25 of these credits at or above the 600 level.

Credit Required in Education Courses.—Either (A) a minimum of 32 credits in the M.Ed. program, of which at least 24 are at or above the 600 level; or (B) 48 credits in the undergraduate and graduate program, but in no case less that 16 credits at or above the 600 level in the M.Ed. program.

Credit Required in Courses Outside of Education.—Nine credits for students in the departments of Administration and Supervision, Elementary Education and Personnel Services; 25 credits for students in Secondary Education and Foundations of Education, except only 9 credits required for those entering with deficiencies in Education.

All M.Ed. programs include a core of required courses consisting of at least one course from two of the following four areas: General Curriculum; Psychological Foundations of Education; Social, Philosophical, Historical or Comparative Foundations of Education; Measurement or Statistics.

Each student is required to submit a plan of study which shows acceptable balance and direction. The planned program is to be approved by the student's counselor, the chairman of the student's area of specialization in Education, and the Office of Graduate Studies in Education during the first term of work

or before. After the program has been developed, any change must be requested in writing and similarly approved.

TRANSFER OF CREDITS.—If recommended in advance by the graduate committee and approved by the Dean of the Graduate School, a student may be permitted to study in other institutions to the extent of (but not to exceed) 9 credits. No graduate credits earned prior to admission to the University may be transferred without special recommendation of the graduate committee and the approval of the Graduate Council. No more than 9 credits may be thus transferred.

STATE CENTERS FOR CONTINUING EDUCATION.—Students may study for the Master of Education degree in State Centers for Continuing Education provided they have been fully admitted to the Graduate School of the University of Florida (7 ED classification), or if they are in the process of applying for admission. If admitted during the quarter in which they are enrolled in a course, the credit received may apply toward the degree provided it is appropriate to a planned program. Degree credits earned in a Center are subject to the limit on off-campus work given below.

Students not working toward a degree in the University System may also register for courses at these centers provided they have been admitted to the University of Florida for post-baccalaureate study (6 ED classification), or are in the process of applying for admission. Except for students holding a master's degree, enrollment in this status is limited to two courses.

LIMITS ON OFF-CAMPUS WORK.—The University limits off-campus work taken in extension, in other institutions, and in the Florida State Centers for Continuing Education. The limits imposed are as follows: (1) extension credit—9 credits; (2) residence credit transferred from another accredited institution—9 credits; (3) residence credit earned in a Florida State Center for Continuing Education—25 credits. Any credits offered from (1) or (2) above reduce by the same amount the credit accepted from (3). Acceptance of credit toward the M.Ed. degree from any of these sources is contingent upon the appropriateness of the work in the program planned by the student and his counselor.

ON-CAMPUS RESIDENCE REQUIREMENTS.—25 credits must be taken on the Gainesville campus including at least one quarter in full-time residence.

ADMISSION TO CANDIDACY.—Admission to candidacy for the Master of Education degree is recommended to the Graduate Council by the Graduate Committee of the College of Education on the basis of an evaluation of the applicant at the end of from 16 to 25 credits of graduate work at the University of Florida. The student is responsible for filing the application no later than the quarter prior to that in which he plans to graduate.

This evaluation is based in part on (1) the student's academic record, (2) the student's GRE scores, (3) evidence of competency in the use (oral or written) of the English language, (4) evaluation of personal qualities and promise of professional attainment by persons to whom the applicant's record is known, (5) the student's experience record, and (6) other appropriate information.

This process is administered through the Office of Graduate Studies in Education for the graduate committee which may recommend supplementary oral

and/or written examinations for students whose admission to candidacy is in doubt.

The student's remaining program of study may be revised if needed after the Admission to Candidacy Examination. On approval of the graduate committee, the candidate will be recommended for the degree upon the satisfactory completion of the designated course work.

The candidate must have completed at least one year of teaching (or the equivalent) prior to taking the last 9 credits of work, or must have included in his record the satisfactory completion of an internship program or a minimum of 9 credits of student teaching.

THE GRADUATE COMMITTEE OF THE COLLEGE OF EDUCATION.—A special counselor is appointed for each student in the Master of Education program. His work is under general supervision of the Graduate Committee in the College of Education.

## MASTER OF ENGINEERING

The Master of Engineering degree is designed for those students whose needs are better suited to additional course work rather than the preparation of a thesis. Requirements for admission are the same as for regular M.S.E. degrees in the College of Engineering.

WORK REQUIRED.—A minimum of 50 credits of course work shall be required of which at least 27 credits must be in the student's major field. (Fifty-four credits of course work are required for the degree of Master of Engineering in Bioenvironmental Engineering and Master of Engineering in Nuclear Engineering Sciences.) The minor field may be divided in several ways: one 9-credit minor, two 9-credit minors, or one 18-credit minor may be taken. In addition, an undesignated minor in departments other than the major may be authorized by the supervisory committee or program adviser. Major courses must be graduate level (numbered 600 and above) or courses approved for graduate major credit. Courses numbered 300 and above may be taken for the minor. At least 50 per cent of the required 50 credits must be in courses numbered 600 and above.

DEGREE CREDIT.—In order to qualify for course work toward the Master of Engineering degree, a student must first be admitted to the Graduate School at the University of Florida. The amount of course work toward this degree that may be taken at an off-campus center will depend upon the student's individual program and the courses provided through the center.

The supervisory committee for those students in residence at the Gainesville campus of the University of Florida shall be the same as that shown under MASTER'S DEGREE WITH THESIS.

At the option of the department involved, students whose program does not include 27 credits of study taken on the Gainesville campus may be supervised by a single program adviser appointed by the Dean of the Graduate School upon the recommendation of the Dean of the College of Engineering.

EXAMINATIONS.—Each student must pass a comprehensive written and/or oral final examination at the completion of his course work. For students

whose program includes 27 credits of study taken on the Gainesville campus, this examination will be administered by the supervisory committee.

Other candidates must take a comprehensive written examination administered on the University of Florida campus by an examining committee recommended by the Dean of the College of Engineering and appointed by the Graduate School. At least one member of the examining committee shall either be a member of the student's supervisory committee or his program adviser. Another member must be chosen from outside the major department for the purpose of representing the student's minor.

For more information on Master's Degrees in Engineering see the brochure on this subject available from the College of Engineering.

## Master of Nursing

The program leading to the degree Master of Nursing is designed to give students basic knowledge and professional skills essential to the three areas of nursing activity: teaching, research, and practice. The diversity of roles that the nurse performs in these three areas necessitates a program that requires preparation in clinical, research, and functional activities. Two basic qualifications necessary for completion of the program are: (1) academic ability to perform satisfactorily in the course requirements; (2) ability to work effectively as a professional nursing practitioner. Traineeship grants and graduate assistantships for selected students are available. See *Financial Aid—Nursing* for more detailed information.

Work Required.—The minimum requirement of 50 credits is distributed in the following areas: 8 credits in general nursing; 4 credits in research; 8 credits in the functional area; 9 credits of electives; and at least 16 credits in the clinical specialty areas, although additional credits may be required depending on the clinical area of choice. A minimum of 8 credits shall be taken outside the College of Nursing. At least 50 per cent of the minimum course requirements must be in courses numbered 600 and above. There is no thesis or foreign language requirement.

Admission to Candidacy.—Admission to the work of this program is not a guarantee that the student will be admitted to candidacy for the degree. When a student has completed 18 to 24 credits of graduate work at the University of Florida, he is required to apply for admission to candidacy for the degree, using the forms provided by the office of the Dean of the Graduate School. Admission to candidacy for the Master of Nursing degree will be recommended to the Graduate Council by the graduate committee of the College of Nursing on the basis of a review of the student's work and any other appropriate information to determine his eligibility to proceed further toward the degree program.

Final Examination.—Each student must pass a comprehensive written and/or oral final examination toward the end of the final quarter of study. The examination will be administered by an examining committee of three members of the graduate faculty of the College of Nursing recommended by the College Dean and appointed by the Dean of the Graduate School.

The examination(s) will be confined largely to the student's major field of study.

### Master of Physical Education and Health

Work Required.—A minimum of 51 credits of course work is required, of which at least 50 per cent must be graduate-level courses in physical education. Of the remaining 50 per cent, at least three courses must be taken outside the College of Physical Education and Health. The major for the degree is physical education.

All degree candidates must complete Florida teaching certification requirements in physical education by the conclusion of the master's degree program. Certification requirements must be met as part of and/or in addition to degree requirements, if not already completed before admission to graduate study.

Off-Campus Work.—The regulations governing the use of off-campus work are the same as those for the Master of Education above.

Supervisory Committee.—A committee of five members of the faculty of the College of Physical Education and Health, with the dean of the college, or some person designated by him, serving as chairman and the Dean of the Graduate School as an ex officio member, will supervise the work of students registered in this program, subject to the approval of the Graduate Council.

Admission to Candidacy.—Admission to the work of this program is not a guarantee that the student will be admitted to candidacy for the degree. The student will be required to pass a written and/or oral examination in addition to being recommended by the supervisory committee for admission to candidacy. The student should normally apply for admission to candidacy at approximately the mid-point of his total program, but not later than two quarters before his expected date of graduation.

Final Examination.—A thesis is not required, but the candidate must pass a final examination at the close of his course work. This written and/or oral examination will be administered by the supervisory committee and will be confined largely to the student's major field of study.

### Master of Rehabilitation Counseling

The interdisciplinary program leading to the degree of Master of Rehabilitation Counseling is designed to give students basic knowledge and professional skills essential to the rehabilitation of physically, mentally, and emotionally handicapped persons. The diversity of activities performed by individuals who bear the designation of rehabilitation counselor in the various state, federal, and private agencies, necessitates a program that permits a basic foundation in counseling and guidance and, at the same time, allows for a sound preparation in the medical, socio-psychological and vocational implications of disability. Two basic qualifications are necessary for successful completion of the program: (1) the academic ability to accomplish the course requirements with satisfactory performance, and (2) the ability to work effectively with disabled people in a counseling relationship. Students interested in counseling the mentally retarded will be encouraged to specialize in this

area through the utilization of certain elective course offerings and through the internship stage of their educational program. Traineeship grants for selected students are available. See page 44 for more detailed information regarding these grants.

WORK REQUIRED.—The minimum requirement is 63 credits, of which 39 credits represent required work in rehabilitation courses including an internship. An additional minimum of 24 credits is selected from designated courses; i.e., 1 to 3 courses in each of the following areas: (1) statistics and measurement, (2) personality development, and (3) counseling. The selection of the courses in each of the three areas is made on the basis of meeting the individual needs of the student and is subject to the approval of a supervisory committee. At least 50 per cent of the minimum course requirements shall be from courses numbered 600 and above.

AREA I—STATISTICS AND MEASUREMENT—1 to 3 courses

CORE OFFERINGS

PSY 503—Essentials in Psychological Testing
EDF 360—Elementary Statistical Methods in Education
STA 320—Introduction to Statistics
EDP 613—Personnel Testing
PSY 641—Personality Assessment: Basic Procedures

ELECTIVE OFFERINGS

PSY 512—Individual and Group Differences
PSY 603—Statistical Methods: Inference
PSY 604—Statistical Methods: Correlation

AREA II—PERSONALITY DEVELOPMENT—1 to 3 courses

CORE OFFERINGS

PSY 410—Abnormal Psychology
PSY 509—Theories of Personality
EDF 641—Educational Psychology: Personality Dynamics
PSY 615—Survey of Social Psychology
PSY 669—Seminar: Motivation

ELECTIVE OFFERINGS

PSY 308—Development Psychology
PSY 610—Seminar in Psychopathology
SY 621—The Sociology of the Aged
PSY 661—Seminar: Psychological Problems of Aging
SY 556—Social Factors in Health and Illness
EDP 501—Teaching the Mentally Retarded
EDP 503—Teaching Neurogically Damaged Children
EDP 504—Teaching Emotionally Disturbed and Socially Maladjusted Children
EDP 601—Education of the Mentally Retarded
EDP 661—Problems in Exceptional Child Education
SY 635—Comparative Studies of Health Systems in Human Societies
SY 636—Health Services and Personnel in the Modern Community

AREA III—COUNSELING—1 to 3 courses

CORE OFFERINGS

PSY 637—Personal Counseling
EDP 610—Principles of Guidance: The Helping Relationship
EDP 611—Occupational and Educational Information
EDP 614—Theory and Practice in Counseling I

ELECTIVE OFFERINGS

PSY 613—Children's Behavior Disturbances
SCH 617—Seminar in Speech Pathology I
SCH 518—Speech Pathology
SCH 611—Seminar in Hearing
SCH 623—Problems of the Deaf
EDP 616—Practicum in Counseling

INTERNSHIP IN MENTAL RETARDATION.—Students who are particularly interested in working with the mentally retarded may take a specialized internship at the Field Instructional Unit in Mental Retardation at MacDonald Training Center. Prior to this internship, students may elect to take one or more of the EDP course sequence in Area II listed above.

POLICY COMMITTEE.—A committee of five members of the faculty representing the College of Health Related Professions, Department of Psychology, College of Medicine, and College of Education, with the professor in charge of rehabilitation counseling serving as chairman and the Dean of the Graduate School as an ex officio member, will determine policy, and, in general, supervise the work of students registered in this program.

ADMISSION TO CANDIDACY.—Admission to the work of this program is not a guarantee that the student will be admitted to candidacy for the degree. When a student has completed 36 credits of graduate work at the University of Florida (but not less than two quarters before he plans to graduate), he is required to apply for admission to candidacy for the degree, using the forms provided by the office of the Dean of the Graduate School. Admission to candidacy for the Master of Rehabilitation Counseling degree will be recommended to the Graduate Council by a supervisory committee of the College of Health Related Professions on the basis of a review of his work, his personal traits, and any other appropriate information to determine his eligibility to proceed further toward the degree.

DEPARTMENTAL STUDY PROJECT.—A thesis is not required, but the candidate must complete an approved departmental study or research project as part of the degree requirements.

FINAL WRITTEN AND/OR ORAL EXAMINATION.—Upon the satisfactory completion of all course work including the practicum and internship, each student must take a final written and/or oral departmental examination before the degree will be awarded. The primary purpose of this examination is to determine the student's ability to relate the knowledge, skills and techniques learned in the academic program to the more practical applications of working effectively with disabled individuals.

## MASTER OF STATISTICS

The basic requirement for admission to the graduate program for the Master of Statistics degree is an A.B. or B.S. degree from a recognized college

or university. The normal admission requirements will be a B-average undergraduate record for the upper division studies and satisfactory scores on the Graduate Record Examination.

WORK REQUIRED.—The minimum registration required for the Master of Statistics degree is 54 credits including no less than 30 credits in the major field. Courses in the degree program will be selected in consultation with the major adviser and approved by the student's supervisory committee. One 9-credit minor is required. The work in the major field must be in courses approved for graduate major credit. For the minor, courses numbered 300 and above may be taken. At least one-half of the 54 credits in regular course work must be in courses numbered 600 and above. The student will be required to pass, as judged by his supervisory committee, a comprehensive written examination covering the major and minor subjects. In addition, he will be examined orally on his major subjects.

For further details, inquire Chairman, Department of Statistics or Dean, College of Agriculture.

## MASTER'S DEGREE WITH THESIS

REQUIRED REGISTRATION.—The minimum registration required for the master's degree with thesis is 45 credits, including no less than 36 credits of regular course work and up to 9 credits of the research course numbered 699 in all departments.

At least one-half of the required credits of regular course work must be in a single field of study designated the major, and the remainder, normally called the minor, must be in a different but related subject matter. One 9-credit minor is required; two 9-credit minors or one 18-credit minor may be taken. In certain departments an undesignated minor made up of related courses from different departments may be taken. Minor work must be in a department other than the major. In special cases this requirement may be modified, but only with the written permission of the Dean of the Graduate School.

The work in the major field must be in courses designed strictly for graduates (numbered 600 and above) or in undergraduate courses designated by the Graduate Council as available for graduate major credit. For the minor, courses numbered 300 and above may be taken. At least 18 of the required 36 credits of regular course work must be in courses numbered 600 and above. Registration in 699 is limited to a total of 24 credits.

THESIS.—All candidates for this degree are required to prepare and present a thesis (or equivalent in creative work) acceptable to their supervisory committees and the Graduate School. The candidate should consult the Graduate School office for instructions concerning the form of the thesis. The original copy of the thesis, bound in temporary binding and accompanied by three copies of a brief abstract must be in the Dean's office on or before the

dates specified in the *University Calendar*. After the thesis is accepted, the original copy, together with the first carbon copy, will be deposited in the University Library.

LANGUAGE REQUIREMENTS.—(1) The requirement of a reading knowledge of a foreign language is left to the discretion of the student's supervisory committee or college. When a foreign language is required, the examination will be conducted by Educational Testing Service or by the Department of Foreign Languages; if an examination has already been passed at another institution, it must be validated at the University of Florida by the Department of Foreign Languages. If the student is majoring in a foreign language, that language may not be used to satisfy this requirement. The foreign language requirement must be satisfied before the student is admitted to candidacy. (2) The ability to use the English language correctly and effectively, as judged by the supervisory committee, is required of all candidates. Hence this cannot be substituted for the foreign language requirement.

SPECIAL SUPERVISORY COMMITTEE.—A special supervisory committee composed of two (or more) members will be appointed for each student by the Dean of the Graduate School upon the recommendation of the college concerned. The chairman of the committee must be a member of the Graduate Faculty appointed for this purpose. The student's minor should be represented by one member of the committee. This committee should be appointed as early as possible after the student has been admitted to the Graduate School and, in general, not later than the end of the first quarter of study. The Dean of the Graduate School is an ex officio member of all supervisory committees. The duties of the special supervisory committee are to advise the student, to check on his qualifications and progress, to supervise the preparation of the thesis, and to conduct the final examination. No fewer than three faculty members must be present at the student's final examination, but only the members of the official supervisory committee are required to sign the thesis and the report of the final examination.

ADMISSION TO CANDIDACY.—Attention of students is directed to the fact that admission to candidacy is not automatic. It requires a formal application distinct from registration. Applications for admission to candidacy for master's degrees should be approved by the Graduate School when course work is half completed and in no case later than two quarters prior to the date for completion of all requirements for the degree.

The Graduate Council may deny degrees to persons who have failed to comply with this regulation at the proper time. In order to be admitted to candidacy, the student must have (1) maintained a B average in registered course work, (2) passed a foreign language examination and a qualifying examination (if these are required in his curriculum), (3) chosen his thesis topic, (4) satisfied his supervisory committee, department chairman, and college dean that he is qualified to become a candidate for his degree. It is the responsibility of his supervisory committee at this time to make such investigation as is necessary to determine his eligibility. *See page 14 of this Catalog.*

FINAL EXAMINATION.— When all of the student's course work is com-

pleted, or practically so, and the thesis is in final form, his supervisory committee is required to examine him orally or in writing or both on (1) his thesis, (2) his major subjects, (3) his minor or minors, and (4) matters of a general nature pertaining to his field of study. An announcement of the scheduled examination must be sent to the Dean of the Graduate School. Using the form provided for the purpose the committee shall report in writing to the Dean of the Graduate School not later than one week before the time for conferring of the degree whether all work has been completed in a satisfactory manner and whether on the basis of the final examination the student is recommended for his degree. In no case may this examination be scheduled earlier than six months before the degree is to be conferred, without special approval of the Graduate Council.

### Master of Fine Arts

The degree of Master of Fine Arts is designed primarily for those who wish to prepare themselves as teachers of art in colleges and universities. It is the highest degree granted in the studio fields of the fine arts. Two years' residence is normally required for completion of requirements. Specialization is offered in ceramics, creative photography, drawing, painting, printmaking, and/or sculpture.

The requirements of the M.F.A. are the same as those for other master's degrees with thesis except as follows:

1. The minimum registration required is 72 credits, including no fewer than 63 credits in regular course work and 9 credits in ART 699—Master's Research.

2. The course work must include ART 500—Methods of Research and Bibliography (3 credits), a minimum of 9 additional credits in the history and theory of art, and a minimum of 9 credits in a minor field. The remaining credits will be advanced studio courses in ceramics, creative photography, drawing, painting, printmaking, and/or sculpture.

## THE ADVANCED SCHOOL OF THE COLLEGE OF EDUCATION

The Advanced School of the College of Education offers programs leading to the degrees Specialist in Education and Doctor of Education. These programs are available in four areas: Administration and Supervision, Curriculum and Instruction, Foundations of Education, and Personnel Services. The Specialist in Education degree is awarded for a year of specialization beyond the master's degree. The Doctor of Education degree requires the writing of a doctoral dissertation. Foreign languages are not required.

Admission to the Advanced School in Education.—Admission to the Advanced School will be open only to persons who have:

1. Successfully completed 50 credits of professional course work in education. Applicants for admission to the Advanced School of the College of Education who meet all the requirements except for successfully completing 50 credits of professional education courses may be given pro-

visional admission, and full admission when they have completed the required 50 credits.

2. Presented a record of successful professional experience, the appropriateness of which will be determined by the instructional department passing on the applicant's qualifications for admission. (In some instances, departments may admit students with the understanding that further experience may be required before the student will be recommended for the degree.)

Admission to the Advanced School will be based on the following criteria:

1. High scholastic average for previous graduate work (3.5 grade-point average or above, as computed at the University of Florida, will be considered evidence of good scholarship).
2. Satisfactory scores on the Aptitude Test of the Graduate Record Examination.
3. An oral examination administered by the department or division in which the student seeks to specialize.
4. Special interviews for individuals for whom the department of specialization seeks more data.

The judgment concerning admission of an individual student will be based on consideration of his performance in all of these areas by the department in which the student desires to specialize. The department will certify to the admissions committee that the student has met the criteria for admission to the Advanced School.

In all cases the record, experience, and personal qualifications of the person applying for admission are subject to the approval of the admissions committee.

Where possible, students should seek admission to the Advanced School before enrolling in any courses beyond the master's degree. Where this procedure is impossible, the student will register in the Graduate School, and, during the first quarter of his work beyond the master's degree, will apply for admission to the Advanced School. If the candidate is found to be eligible, appropriate work taken during that term will be included in the planned program.

After completion of the master's degree any student approved by the admissions committee may register for courses, but admission to the Advanced School must be obtained before work may be counted for degrees or certificates above the master's level.

## Specialist in Education

The Ed.S. degree is awarded at the completion of a 50-credit planned program beyond the master's. Primary emphasis in an Ed.S. program is placed on the development of the competencies needed for a specific job. Programs are available in the various areas of concentration within the departments of Administration and Supervision, Foundations of Education, and Personnel Services, and the division of Curriculum and Instruction.

The 50-credit program is planned to focus upon one identified area of specialization, with 32 credits at the 600 and 700 levels. At least 16 of the 50 credits must be in professional Education courses at the 600 level or above. One learning experience designed to unify the program for the specialty shall be provided by an internship, a practicum, a project and report, a field experience, a research study, or other suitable activity as determined by the departmental adviser. All programs must include one course in research. A thesis is not required.

A student who wishes to work for a degree in one of these programs must be admitted to the Advanced School of the College of Education and be accepted by the appropriate departmental admissions committee.

A maximum of 9 credits of transferred credit may be included. Such work must have been completed in residence at an institution which offers the doctor's degree. An additional 8 credits of Graduate Residence credit will be accepted from work taken in a Florida State Center for Continuing Education.

At least two quarters of full-time post-master's residence on campus in Gainesville are required.

Admission to the Advanced School, the successful completion of one quarter of work, and the approval of the department of specialization are required for admission to candidacy for the Specialist in Education degree.

Toward the end of the 50-credit program the student is given a final written and a final oral examination by a committee selected by the head of his area of specialization. After he has passed the examination the candidate is awarded the Specialist in Education degree upon the approval of the faculty and the Graduate Council.

All work for the Specialist in Education degree must be completed within seven years from the time of first registration.

## Doctor of Education

The Doctor of Education degree is offered in administration and supervision, curriculum and instruction, foundations of education, and personnel services. Each doctoral candidate is expected to achieve understanding of the broad field of education and competencies in the area in which he chooses to specialize.

The program leading to this degree is administered through the Office of Graduate Studies in Education, which carries out the policies of the Graduate School and the graduate committee of the College of Education.

Admission to a program of work leading to the degree of Doctor of Education requires admission to the Advanced School of the College of Education, described previously, as well as admission to the Graduate School.

All courses beyond the master's degree taken at another institution, to be applied toward the Doctor of Education degree, must be taken at an institution offering the doctor's degree and must be approved for graduate credit by the Graduate School of the University of Florida.

Minors.—Minor work or work in cognate fields is required. If one minor is selected, at least 25 credits of work therein will be required; if two minors

are chosen, one must have at least 18 credits of course work, the other at least 8 credits. Minors may not be taken in any branch of education.

Courses in physical education approved by the College of Physical Education and Health and the Graduate School as subject matter or content courses may be used in the cognate work or as a minor.

In lieu of a minor or minors, the candidate may present a suitable program of not less than 25 credits of cognate work in at least two or more departments outside the College of Education. If two fields are included, there shall be no fewer than 8 credits in either field. If three or more fields are included, the 8-credit requirement for each field does not apply. This program must have the approval of the student's supervisory committee. The College of Education faculty will expect the candidate to be prepared to answer questions, at the time of his oral examination, in any of the areas chosen.

ADMISSION TO CANDIDACY.—Admission to candidacy for the degree of Doctor of Education rests on successful completion of the qualifying examinations. Recommendation to the Graduate School for admission to candidacy is based on the action of the supervisory committee, subject to the approval of the graduate committee of the College of Education.

THE QUALIFYING EXAMINATION.—The applicant is recommended for the qualifying examination by his supervisory committee after he has completed sufficient course work.

The examination administered by the graduate committee of the College of Education consists of (1) a general section; (2) a field of specialization section; (3) examination in the minor or minors, where involved; and (4) an oral examination conducted by the applicant's supervisory committee.

RE-EXAMINATION.—If the student fails in his qualifying examinations he will not be given a re-examination unless such an examination is recommended for special reasons by his supervisory committee and approved by the Graduate Council. At least one quarter of additional preparation is considered essential before re-examination.

THE SEMINAR.—Each student is required to develop a thesis project to be considered by a general doctoral seminar in the college. Participants in the seminar will be faculty members of the college, other advanced students, and members of the supervisory committee. The student must pass the qualifying examination before scheduling the seminar.

RESEARCH PREPARATION REQUIREMENT.—This requirement is satisfied by meeting the requirements in both Groups 1 and 2 below:

Group 1.—(1) a course in education research (EDF 760) and
(2) the library usage examination (usually given in connection with EDF 760) and
(3) a basic course in statistics.

Group 2.—Either
(1) a reading knowledge of one foreign language relevant to the student's needs, *or*
(2) an appropriate course in measurement, advanced statistics, or research approved by the student's supervisory committee and by the Graduate Committee of the College of Education.

There is no language requirement for the Doctor of Education degree.

For information relating to *Residence,* the *Supervisory Committee, Time Limit,* the *Dissertation, Publication of the Dissertation,* and the *Final Examination,* the student is referred to the material presented under the heading *Doctor of Philosophy.* These statements are applicable to both degrees.

# REQUIREMENTS FOR THE PH.D.

## COURSE REQUIREMENTS

Doctoral study consists of the independent mastery of a field of knowledge and the successful prosecution of research. For this reason, doctoral students act, in large measure, on their own responsibility, and doctoral programs are more flexible and varied than those leading to lower degrees. The Graduate Council does not specify just what courses will be required for the Ph.D. degree, or how many. The basic general requirement is that the program should be unified in relation to a clear objective and that it should have the considered approval of the student's entire supervisory committee.

MAJOR AND MINOR.—The student working for the Ph.D. must elect to do his major work in a department specifically approved for the offering of doctoral courses and the supervision of dissertations. These departments are listed on page 3 of this *Catalog.* In addition, the student must choose one or more minor fields. Minor work may be completed in any department, other than the major department, approved for master's or doctor's degree programs, as listed in this *Catalog.*

If one minor is chosen, the representative of the minor department on the supervisory committee should suggest from 18 to 36 credits as preparation for a qualifying examination. Of course, a part of this background may have been acquired in the master's program. If two minors are chosen, each must include at least 12 credits. The satisfaction of the requirement concerning the minor or minors may be in terms of a written examination conducted by the minor department or departments and/or through the oral qualifying examination.

Course work in the minor at the doctoral level need not be restricted to the courses of one department, provided that the minor shall have a clearly stated objective and that the combination of courses representing the minor shall be approved by the Graduate School before registration beyond 6 credits of course work applicable to the minor. This procedure is not required for a departmental minor. The supervisory committee may include a representative from each subject-matter area included in the minor, and each department so involved must express its wishes in the matter.

## SUPERVISORY COMMITTEE

The supervisory committee for a candidate for the doctoral degree shall consist of no fewer than three members. At least two members will usually be from the college or department recommending the degree, and at least one member shall be drawn from a different educational discipline for the purpose of representing the student's minor. In the event that the student elects more

than one minor, each minor area may, at the discretion of the departments concerned, be represented on the supervisory committee. The chairman, and at least one additional member of the committee shall be members of the resident Graduate Faculty of the University of Florida who have been approved for the direction of doctoral dissertations. Supervisory committees are nominated by the department chairman, approved by the dean of the college concerned, and appointed by the Dean of the Graduate School. In unusual cases the doctoral research may require the guidance of a specialist from an area of study other than that of the chairman of the supervisory committee. In such cases the department chairman may recommend appointment of a chairman and a co-chairman, with the latter being a member of the Graduate Faculty, but not necessarily having been approved for the direction of doctoral dissertations. A co-chairman may also be appointed for the purpose of serving during a planned absence of the chairman; in this case both the chairman and the co-chairman shall have been appointed to the Graduate Faculty for the purpose of directing doctoral dissertations. The committee should be appointed as early as possible after the student has begun doctoral work, and in general no later than the end of his first quarter of equivalent full-time study. The Dean of the Graduate School is an ex officio member of all supervisory committees and should be notified in writing well in advance of all meetings of such committees.

The duties of the supervisory committee are as follows:

1. To inform the student of all regulations governing the degree sought. It should be noted, however, that this does not absolve the student from the responsibility of informing himself concerning these regulations. (*See Student Responsibility.*)
2. To meet immediately after appointment to pass on the qualifications of the student and to discuss and approve a program of study for him.
3. To meet to discuss and approve the proposed dissertation project and the plans for carrying it out.
4. To conduct the qualifying examination or, in those cases where the examination is administered by the department, to take part in it. In either event, no fewer than five faculty members shall be present for the oral portion of the examination.
5. To meet when the work on the dissertation is at least one-half completed to review procedure, progress, and expected results, and to make suggestions for completion.
6. To meet when the dissertation is completed to conduct the final oral examination and to satisfy itself that the dissertation is a piece of original research and a contribution to knowledge. No fewer than five faculty members shall be present for this examination, but only the members of the official supervisory committee are required to sign the dissertation.

## LANGUAGE REQUIREMENTS

Language Reading Examinations.—(1) Except as noted below a reading knowledge of two languages other than English is required. The primary language must be French, German, Russian, or Spanish, the choice to be made

by the supervisory committee on the basis of the usefulness of the language in the student's field of research.

(2) The secondary language, as approved by the supervisory committee, may be from a list of languages adopted by the Graduate Council, in which reading knowledge examinations are administered by the Department of Foreign Languages. Under this provision, however, both languages may not be Romance.

If a student is majoring in a foreign language he may not use that language to satisfy this requirement.

FUNCTIONAL EXAMINATION IN LANGUAGE.—A doctoral student, with the approval of his supervisory committee, shall have the privilege of taking a functional language examination (reading, writing, and speaking) in French, German, Russian, or Spanish as an alternative to the primary and secondary language reading examinations. A student may not fulfill the foreign language requirement by taking a functional knowledge examination in his native tongue.

A student who makes an A or B in the final course of the second-year sequence of a foreign language (e.g., German 202, Spanish 202) will be certified as having fulfilled the requirement for a functional knowledge of that language if he takes this final course during his period of graduate study at the University of Florida. Otherwise, he may demonstrate this level of proficiency by examination (given only at announced times) during his period of graduate study. Students in Latin American Studies (see pp. 48-49) must demonstrate proficiency in Spanish or Portuguese equivalent to a grade of A or B in Spanish 306 or Portuguese 305.

SUBSTITUTION OF MATHEMATICS FOR A SECONDARY LANGUAGE EXAMINATION.—In order to strengthen the mathematics background of students in certain departments individually approved by the Graduate Council (agricultural economics, agronomy, animal science, business administration, entomology, and soils), where junior-level mathematics is not required in the department's undergraduate curriculum, a mathematics examination may be substituted for a reading knowledge examination of the secondary foreign language. To meet the required degree of proficiency in mathematics, the student, while enrolled in the University of Florida, must make a grade of B on the final examination of MS 304, or a B in the course MS 304, or a grade of C in any mathematics course which requires MS 304 as a prerequisite. The Department of Mathematics of the University of Florida will certify the level of courses taken by a student outside the University of Florida who is applying for the privilege of substitution, and the Department of Mathematics will determine by written or oral test whether the student meets the level of achievement stated above, and will certify the result to the Graduate School.

ADDITIONAL LANGUAGE REQUIREMENT.—For the additional language requirements of the programs of Latin American Studies and the Latin American Language and Area Program see page 48.

DATES FOR COMPLETION OF LANGUAGE REQUIREMENTS.—The language requirement should be met as early as possible in the student's program and must be met before the student can be admitted to the qualifying examination. The Department of Foreign Languages offers special noncredit classes in the

reading of French and German for graduate students. (*See Schedule of Courses.*)

## RESIDENCE

The minimum residence requirement for a doctor's degree is nine quarters of full-time resident graduate study, or equivalent, at institutions approved by the Graduate School. Beyond the master's degree or an equivalent period of graduate study, three consecutive quarters must be spent in full-time study (except as noted in the following paragraph) on the campus of the University of Florida. Candidates in the College of Agriculture may do their research at certain branch stations of the University of Florida Agricultural Experiment Station where adequate staff and facilities are available.

Part-time study may be substituted for the three consecutive quarters of full-time study stipulated in the preceding paragraph in either of the following proportions: (1) 45 credits earned in one calendar year; or (2) 52 credits in six successive registrations (either including or excluding summer registration).

An overload program, even when approved, will be valued as a normal program in meeting all residence requirements.

For a student who has no employment and is devoting full time to his studies, a registration of 12 to 15 credits entitles him to full residence credit. Part-time study is evaluated on the basis that 15 credits represent a full load (e.g., a student who is employed half-time and is registered for 10 credits acquires $^{10}/_{15}$ or $^{2}/_{3}$ of a quarter of residence credit for each quarter of such registration).

In some cases a student may be employed on a sponsored project from which his thesis or dissertation will be drawn. Upon written recommendation of the chairman of the supervisory committee, residence credit may be permitted for the time devoted to such research. This recommendation must be made during the quarter in which the work is done. All time devoted to routine duties, or to research not related directly to the dissertation or thesis, should be removed from consideration.

Between the qualifying examination and the date of the degree, there must elapse a minimum of two quarters if the candidate is in full-time residence, or three quarters if the candidate is on less than a full-time basis. The quarter in which the qualifying examination is passed is counted, provided that the examination occurs before the midpoint of the term.

## QUALIFYING EXAMINATION

The qualifying examination which is required of all candidates for the degree of Doctor of Philosophy may be taken during the third term of the second year of graduate study. The examination, conducted by the special supervisory committee, with the aid of the major and minor departments, is both written and oral and covers the major and minor subjects. The supervisory committee has the responsibility at this time of deciding whether the student is qualified to go on with work toward the Ph.D. degree.

If the student fails in his qualifying examination, he will not be given a reexamination unless such an examination is recommended by his supervisory

committee and approved by the Graduate School. At least a quarter of additional preparation is considered essential before re-examination.

An announcement of the scheduling of each student's qualifying examination must be submitted in writing to the Dean of the Graduate School. If the student does not file for admission to candidacy immediately after his qualifying examination, a written report of the result of his examination must be filed with the Graduate School Office.

TIME LIMIT.—All work for the doctor's degree must be completed within five calendar years after the qualifying examination, or this examination must be repeated.

## ADMISSION TO CANDIDACY

A graduate student does not become an actual candidate for the Ph.D. degree until he has been formally admitted to candidacy. Such admission requires the approval of the student's supervisory committee, the chairman of his department, his college dean, and the Dean of the Graduate School. The approval must be based on (1) the academic record of the student, (2) the opinion of his supervisory committee concerning his overall fitness for candidacy, (3) an approved dissertation topic, and (4) a qualifying examination as described above. Application for admission to candidacy is normally made as soon as the qualifying examination has been passed.

## DISSERTATION

A satisfactory dissertation showing independent investigation and research is required of all candidates. Since all doctoral dissertations will be published by microfilm, microcard, or printing, it is necessary that the work be of publishable quality and that it be in a form suitable for publication. The original copy of the dissertation must be presented to the Dean of the Graduate School on or before the date specified in the *University Calendar*. The sum of $50 must be deposited with the University Cashier to cover cost of publication as explained below.

PUBLICATION OF DISSERTATION.—Candidates for the Ph.D. and Ed.D. degrees may choose one of the following three alternatives in the publication of their dissertations:

1. Microfilm. The University will refund $25 of the deposit after the dissertation has been accepted, the final examination passed, and the original, fully signed dissertation and final examination report are returned to the Graduate School.
2. Microcard. The University Library will determine the cost of publication. Should this cost vary from the publication deposit, the student will either receive a refund or be billed for any amount in excess of $50.
3. Book or Monograph. If publication is completed as a book or monograph in essentially complete form within two years,* the Graduate

* A monograph is defined by the Graduate School as a small book devoted to one subject, published under its own cover, listed in either the *Cumulative Book Index* or the *Publisher's Weekly*, and cataloged in accordance with standard American Library practices as a separate book. Reprints of articles do not fulfill this definition.

Council will consider a request for refund of the entire deposit upon receipt of five copies. (Proper reference to the dissertation must be given in the publication.) Unless evidence of acceptance of the dissertation for such publication has been presented by the end of the two-year period, the Graduate Council will authorize publication of the dissertation by microfilm as indicated under (1) above.

COPYRIGHT.—Under (1) above the student may choose to copyright his dissertation before publication. The charge for copyright is $12.75.

### FINAL EXAMINATION

After the acceptance of the dissertation and the completion of all other prescribed work for the degree, but in no case earlier than six months before the conferring of the degree, the candidate will be given a final examination, oral or written or both, by his supervisory committee. An announcement of the scheduled examination must be sent to the Dean of the Graduate School. Satisfactory performance on this examination completes all requirements for the degree.

## EXPENSES

### APPLICATION FEE

Each application for admission to the University must be accompanied by an application fee of $10.00. Application fees are nonrefundable. Further instructions will be found in the Admissions section of this *Catalog*.

### GENERAL

Students should bring sufficient funds, other than personal checks, to meet their immediate needs. Personal checks will be accepted for the exact amount of fees. Other personal checks may be deposited with the University for collection.

Funds may be placed in a depository located in the Student Service Center. Depository accounts are assessed a fee of $1.00 per quarter, or portion thereof. Withdrawals may be made upon request and presentation of passbook. Any University fee or deposit may be paid from such an account.

### CLASSIFICATION OF STUDENTS—FLORIDA OR NON-FLORIDA

For the purpose of assessing fees, applicants shall be classified as Florida or non-Florida students. A Florida student is a person who shall be a citizen of the United States or a resident alien and who shall have resided and had his habitation, domicile, home and permanent abode in the State of Florida for at least twelve (12) months immediately preceding his current registration. In applying this regulation, "applicant" shall mean a student applying for admission to the institution if he is married or 21 years of age, or, if he is a minor, it shall mean parents, parent, or legal guardian of his or her person.

In all applications for admission by students as citizens of the State, the applicant, if married or 21 years of age, or, if a minor, his parents or

legal guardian shall make and file with such application a written statement under oath that such applicant is a bona fide citizen and resident of the State and entitled as such to admission upon the terms and conditions prescribed for citizens and residents of the State.

In the determining of a Florida resident for purposes of assessing fees, the burden of proof is on the applicant. Under the law an applicant can change his place of residence from another state to the State of Florida only by actually and physically coming into the State and establishing his residence with the intention of permanently residing within the State. The domicile or legal residence of the wife is that of the husband, and the legal residence of a minor is that of the parents, parent, or legal guardian of his person.

A non-Florida student may apply in writing for reclassification prior to any subsequent registration under the provisions set forth below. To qualify for reclassification as a Florida student, a person (or if a minor, his parents) shall have resided in Florida for twelve (12) months, shall have filed a declaration of intent to become a resident of the State, and shall be registered to vote in the State. An alien shall have resided in Florida for twelve (12) months and must present U.S. Immigration and Naturalization certification that he is a resident alien. If the application is supported by evidence satisfactory to the University that the student then qualifies as a Florida student, his classification will be changed for future registrations.

## REGISTRATION AND INSTRUCTIONAL FEES

The *University Calendar* appearing at the front of this *Catalog* sets forth the beginning and ending dates of each quarter.

*The following fees and charges are proposed at this time. However, since the catalog must be published considerably in advance of its effective date it is not always possible to anticipate changes and the fee schedule may be revised. Every effort will be made to publicize changes for any quarter in advance of the registration date for that quarter.*

Fees are payable at the beginning of each quarter. *Payment of fees is an integral part of the registration process.* Registration is not complete until payment has been made even though registration material has been accepted by the Registrar. Registration must be completed in accordance with the dates shown in the *University Calendar* appearing at the front of this *Catalog*. No fee is assessed a student who withdraws prior to the first day of classes.

The fees charged are based on the classification of a student as Florida or non-Florida, Full-Time or Part-Time.

Unless an exception is noted, the fees for each quarter include fees for matriculation, student health services, student activities, and a general building fee.

A FULL-TIME FLORIDA STUDENT will pay a fee of $100 for each quarter for which he is enrolled.

A FULL-TIME NON-FLORIDA STUDENT will pay fees of $250 for each quarter for which he is enrolled. ($100 registration plus $150 non-Florida fee.)

A PART-TIME FLORIDA STUDENT, enrolled for not more than five credits, will pay a fee of $40 per quarter. He will not be entitled to student activity or infirmary privileges.

A PART-TIME NON-FLORIDA STUDENT, enrolled for not more than five credits, will pay fees of $85 per quarter. ($40 registration plus $45 non-Florida fee.) He will not be entitled to student activity or infirmary privileges.

A STUDENT, FLORIDA OR NON-FLORIDA, enrolled in the GRADUATE SCHOOL for THESIS ONLY, not to exceed five credits, will pay a fee of $40 for each quarter for which he registers. He will not be entitled to student activity or infirmary privileges.

In any quarter, registration fees should be paid by the end of the day which precedes the beginning of classes. Mail payments must be RECEIVED at the office of the University Cashier by this date. All payments received on or after the first day of classes including fees for additional courses are subject to a $25 late fee. This fee cannot be set aside, nor is it refundable. Refer to the *University Calendar* at the front of this *Catalog* for the dates classes begin.

## GRADUATE ENGINEERING EDUCATION SYSTEM (GENESYS)

Students enrolled in GENESYS will pay a fee of $75 per course; however, the maximum fee charged those taking more than two courses will be $200.

Students enrolled in GENESYS are not entitled to student activity or infirmary privileges.

University policies concerning application and late fees also apply to GENESYS, except that the $25 late fee will not be assessed during the first week of classes.

## SPECIAL FEES

AUDIT FEE.—A regularly enrolled full-time student may audit courses without payment of an additional fee. Others must pay a fee of $25 per course per quarter. Auditor's permit forms may be obtained in the Office of the Registrar. Fees are payable to the University Cashier.

GRADUATE RECORD EXAMINATION.—The Aptitude Test of the Graduate Record Examination is required for admission to the Graduate School. A fee of $7.00 covers the cost of this examination. Students who take one of the Advanced Tests of the Graduate Record Examination in combination with the Aptitude Test pay a fee of $12. These fees are payable to the Educational Testing Service, Princeton, New Jersey. For additional information see page 6 of this *Catalog*.

GRADUATE SCHOOL FOREIGN LANGUAGE TEST FEE.—All students wishing to be certified as proficient in a reading knowledge of French, German, or Russian must take the Educational Testing Service (ETS) Graduate School Foreign Language Tests. A fee of $6.25 covers the cost of each examination. The fee is payable to the University Cashier.

GRADUATION FEE.—Each candidate for a graduate degree must make application for the degree in accordance with the date set forth in the *University Calendar* and pay, at the time of application, a fee of $20. In the event

that the applicant does not meet the requirements for graduation at the time specified in the original application he shall be charged a fee of $5 for each subsequent application for the same degree.

TRANSCRIPT FEE.—A student is furnished a first copy of his record without charge regardless of the amount of work completed. Subsequent copies are charged for at the rate of $1.00 each, except when the order is for more than one copy. There is a charge of $1.00 for the first copy and 50 cents for each additional copy on the same order. University transcripts may be obtained only from the Registrar's Office.

LIBRARY FINES.—A fine of 5 cents a day is charged for each book in general circulation which is not returned within the limit of two weeks. "Reserve" books may be checked out overnight, but a fine of 25 cents is charged for each hour or part of an hour such a book is overdue. There is no maximum for fines and no partial remission of fines when books are returned.

## DEPOSITS

DISSERTATION DEPOSIT.—A deposit of $50 is made to cover the publication of the dissertation. See page 35 for time of payment and choice of method of publication, which involves the disposition of this deposit.

## PREPAYMENTS—UNIVERSITY HOUSING

Applications for assignment to University housing facilities for single or married students must be accompanied by a payment of $10. This payment is nonrefundable. It will be credited against the first rental payment.

## REFUND OF FEES

A refund of fees will be made under certain conditions upon presentation at the Student Depository of a certification of withdrawal date issued by the Registrar.

A full refund of tuition, registration and instructional fees will be made if the student's registration is cancelled before the first day of classes.

A full refund of tuition, registration and instructional fees less a charge of $30 will be made if a student withdraws from the University on the first day of classes which is also the final day of the registration period.

No refund will be made if a student withdraws from the University after the close of the registration period.

No part of the student activity fee will be refunded if the student fails to surrender the certificate of registration at the time the certification of withdrawal date is presented to the University Cashier.

## PAST DUE STUDENT ACCOUNTS

All student accounts are due and payable at the office of the University Cashier at the time such charges are incurred.

Delinquent accounts will be considered sufficient cause for cancellation of registration, as University regulations prohibit registration, graduation, granting of credit or release of transcript for any student whose account with the University is delinquent.

## TRAFFIC AND SAFETY REGULATIONS

All students must register their automobiles or motorcycles at the University Police Department during their first registration period at the University. Certain entrances are reserved for specific areas. Further, there is a system for fines and a point system for on-campus vehicle violations. A complete set of the Traffic and Safety Rules will be found in the offices of the Dean of Men, Campus Police Station, and Student Traffic Court located in the Florida Union. Each student should familiarize himself with these regulations upon registering at the University.

# HOUSING

For Married Graduate Students: Apartment accommodations on the University campus are available for some married graduate students, but there is currently a four- to ten-month waiting period between application and assignment, depending on the assignment period requested.

For Single Graduate Students: Currently under construction and scheduled for occupancy in September, 1967, are two air-conditioned residence halls for upper-division and some graduate students, one hall for men and one for women. Sections of an additional residence hall for graduate men are also available during the entire academic year.

Housing contracts for all single students are for the contract year of four quarters (September to August), if enrolled.

Assistance is given to graduate students in locating off-campus accommodations, and especially to graduate women when on-campus space is unavailable.

### APPLICATIONS

Each student must make personal arrangements for his housing, either by applying to the Office of the Director of Housing for assignment to University housing facilities or by obtaining accommodations in private housing. All inquiries concerning University housing facilities should be addressed to the Director of Housing, University of Florida, Gainesville, 32601.

An application for housing may be filed at any time after application for admission to the University. Prospective students are urged to apply as early as possible because of the housing demand.

Graduate students living in University housing are required to qualify as full-time students as defined by their college or school, and they must continue to make normal progress toward a degree as determined by the head of their college or school.

Roommate requests are honored wherever possible, provided the individuals wishing to room together submit their applications at the same time, clearly indicate on their respective applications their desire to room together,

and are within similar academic classifications. Any student interested in a room assignment with a foreign student should indicate this preference on his application.

### RESIDENCE HALLS FOR SINGLE MEN

Certain sections of Buckman Hall are designated for male graduate students. These sections have room accommodations for from 23 to 27 students. All rooms have lavatories, and there is a community bath on each floor in each section. Coin-operated laundry facilities are located in an adjacent hall. Double rooms for two students rent for $100 per student per quarter, single rooms for $115 per quarter. The number of single rooms is limited. These rates, which include linen rental, are subject to change. Buckman Hall is not air-conditioned and is one of the oldest residence halls on campus. However, it is centrally located, and near the new graduate research library.

The new men's residence hall (now under construction and scheduled for occupancy in the fall of 1967) will be air-conditioned and carpeted throughout. Accommodations will be suites for four students each. Each suite will feature two bedrooms, bath and study-kitchen. The anticipated rate, which includes linen rental, will be $140 per student per quarter.

### RESIDENCE HALLS FOR SINGLE WOMEN

Under construction and scheduled for occupancy in September of 1967 is a new residence hall for women with accommodations similar to those listed above for male students.

For the fourth quarter, Reid Hall is usually assigned to women graduate students. Double rooms for two students rent for $100 per student per quarter, double rooms for one student for $150 per quarter, and single rooms for $115 per quarter. The number of single rooms is limited. These rates, which include linen rental, are subject to change. The facilities of this hall include a main lounge, air-conditioned study room, and laundry room with coin-operated equipment. A small lounge and community bath are located on each floor.

### FACILITIES FOR MARRIED COUPLES

The University operates four apartment villages for married students. To be eligible to apply for and occupy apartment housing on-campus, the following requirements must be met:

The married student must meet the requirements for admission to the University of Florida, qualify as a full-time student as defined by his college or school, and continue to make normal progress toward a degree as determined by the head of his college or school.

The married student must be part of a family unit, defined as husband and wife with or without one or more children. No relatives or housekeepers can be included as part of the family unit. In view of the limited size of on-campus apartments, applications from families having more than four children cannot be accepted.

The married student must be part of a family with a combined annual income which does not exceed $4,800 or $400 per month during the period

of occupancy (including grants-in-aid, scholarships, fellowships, and grants). Since on-campus apartments are intended to provide relatively low-cost housing for married students, a family with a combined annual income in excess of $4,800 cannot apply for or occupy an apartment except in unusual circumstances.

Exceptions may be granted only by the Committee on Student Housing.

Flavet Village III, of temporary frame construction, includes one- and two-bedroom units, which currently rent for $26.75 and $29.50 per month, respectively. These units are equipped with basic furniture, but residents may request that it be stored if they have their own furniture. Refrigerators are available on a monthly rental basis.

Corry and Schucht Memorial Villages, of modern brick, concrete, and wood construction, contain almost an equal number of one- and two-bedroom apartments, with a few three-bedroom units in Corry Village only. These apartments are furnished with basic equipment in living room, kitchen, dining area, and one bedroom. No furniture may be removed from apartments in Corry and Schucht. Rent rates (subject to change) are currently $60, $65 and $75 per month. Applications for the three-bedroom units may be made only by current residents.

Diamond Memorial Village, completed in September, 1965, consists of 208 apartments similar in construction, furnishings and equipment to those in Corry and Schucht Villages. Special features include a community building with air-conditioned study-meeting room, and a study cubicle in each two-bedroom apartment. Rent rates (subject to change) are currently $60 and $70 per month for one- and two-bedroom apartments, respectively.

Residents in all villages must furnish their own linens, dishes, rugs, curtains, etc. Utilities, except for an allowable minimum electricity charge in the Flavet Village, are an extra expense.

### OFF-CAMPUS HOUSING

To aid students in obtaining private rental housing, the Housing Division maintains an Off-Campus Section at 1504 West University Avenue. All inquiries about off-campus housing should be mailed to this address.

Off-campus listings are maintained in the Off-Campus Section but are not compiled for mailing, since availability changes frequently and a mutually satisfactory rental arrangement can usually be made by the student only after personal inspection of facilities and a conference with the householder. Students seeking off-campus housing should come to Gainesville well before the school period to confer with the Off-Campus Office about accommodations. Advance office appointments may be made.

## FINANCIAL AID

### FELLOWSHIPS, ASSISTANTSHIPS, AWARDS, AND LOANS

Fellowships and Assistantships.—To assist able students to pursue postgraduate studies leading to a master's or doctor's degree, a number of fellowships and assistantships are available. Recipients must obtain validation

covering the non-Florida tuition fee from the head of their major department unless these fees are paid by the sponsor.

Applications for fellowships should be received by the chairman of the student's major department by February 15th of each year.

Unless otherwise specified, application for financial support may be made to the chairman of the appropriate department, University of Florida.

### AGRICULTURE

H. HAROLD HUME FELLOWSHIP OF THE FLORIDA FEDERATION OF GARDEN CLUBS.—This fellowship, established by the Florida Federation of Garden Clubs, has for its object the investigation of special problems of ornamental horticulture in Florida. The work is under the direction of the Department of Ornamental Horticulture. The fellowship carries a stipend of $1,800 annually.

### CHEMISTRY

DUPONT POSTGRADUATE TEACHING ASSISTANTSHIP AWARD.—A ten-month $1,200 additional stipend plus $539 in tuition costs is awarded to an advanced graduate student holding a graduate teaching assistantship and who is interested in teaching as a career. The holder assists with undergraduate instruction in chemistry and has a total stipend of from $4,200 to $4,700.

GULF OIL CORPORATION GRADUATE FELLOWSHIP.—One fellowship is available at a stipend of $2,500 for ten months plus tuition and fees for the regular academic year. The choice of research area is optional.

TENNESSEE EASTMAN FELLOWSHIP.—One fellowship is available at a stipend of $3,000 for ten months. The choice of research area is optional.

NATIONAL SCIENCE FOUNDATION SCIENCE DEVELOPMENT GRANT.—Graduate research assistantships supported by the National Science Foundation Science Development Grant are available at a stipend of $3,840 each for twelve months.

CHEMSTRAND FELLOWSHIP.—One fellowship at a stipend of $3,600 for twelve months is available in polymer chemistry.

PETROLEUM RESEARCH FOUNDATION FELLOWSHIPS.—Several are available in certain areas of chemistry at a stipend of $3,000 for twelve months.

KOPPERS SUMMER RESEARCH FELLOWSHIPS.—Two research fellowships are available each at a stipend of $600 for July and August.

### ENGINEERING

Various industrial assistantships and fellowships are available from year to year. These vary in amounts from $2,400 upward. Application should be made to the Director, Engineering and Industrial Experiment Station, College of Engineering.

### HEALTH AND HOSPITAL ADMINISTRATION

TRAINEESHIP GRANTS.—The U. S. Vocational Rehabilitation Administration provides the Graduate Program in Health and Hospital Administration with traineeships for students interested in Rehabilitation Facility Administra-

tion. The traineeship grants provide an annual stipend of $2,400 plus payment of tuition and fees.

For further information regarding these traineeship grants contact: CHAIRMAN, Graduate Program in Health and Hospital Administration, University of Florida, Gainesville, Florida, 32601.

### MEDICINE

Several predoctoral fellowships are available for graduate students in the basic medical sciences. Research positions are available part time on various research projects. Postdoctoral fellowships are available for exceptionally well-qualified recent graduates with either the M.D. or Ph.D. degree who wish additional research experience in clinical or basic science departments. Public Health Service traineeships, which require no clinical duties, are available.

### NURSING

Traineeships are available through the College of Nursing, by grants from the National Institute of Mental Health and U. S. Department of Health, Education and Welfare, to applicants admitted to full graduate status. Stipends are in the amount of $2,400. In addition, non-Florida fees and registration fees are paid.

A number of graduate assistantships are also available through various project grants received by the College of Nursing. Application should be made to the Coordinator of Post-Baccalaureate Nursing Programs, College of Nursing, University of Florida, Gainesville, Florida, 32601.

### PHARMACY

AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION FELLOWSHIPS.—A number of graduate fellowships are offered by the American Foundation for Pharmaceutical Education which carry stipends up to $2,400. In addition, allowances up to $600 may be granted annually for academic expenses. Holders of these fellowships may pursue graduate work at the University of Florida. Application should be made to the Foundation, 777 14th Street, N.W., No. 630, Washington, D.C.

### REHABILITATION COUNSELING

TRAINEESHIP GRANTS.—The U. S. Vocational Rehabilitation Administration has allotted the University of Florida a substantial number of traineeships for full-time students preparing to become rehabilitation counselors. In addition a small number of traineeship grants are available for selected students who wish a greater emphasis on problems associated with counseling the mentally retarded. The traineeship grants for work toward the master's degree carry a stipend of $1,800 for the first year of graduate study and $2,000 for the second year. In addition to these stipends, non-Florida fees and registration fees are paid. A limited number of grants is available for work beyond the master's level and carries larger stipends. Traineeships are awarded for a full calendar year and may be renewed for a second year.

For further information regarding the degree program and traineeship grants contact: CHAIRMAN, Department of Rehabilitation Counseling, College of Health Related Professions, University of Florida, Gainesville, Florida, 32601.

### SPEECH

The Department of Speech administers a number of traineeships, fellowships and assistantships from such sources as the National Institutes of Health; Vocational Rehabilitation Administration; NDEA Title IV; Office of Education; North Florida Crippled Children's Association; and The University.

Additional information may be obtained from the chairman of the Department of Speech.

### UNIVERSITY-WIDE AWARDS

A number of graduate fellowships, research fellowships, and part-time research and teaching assistantships are available annually to meritorious students at stipends ranging from $2,000 to $3,600 for a ten-month period. These are open to candidates in any field of graduate study or research. Postdoctoral fellowships are available. Graduate assistantships are available in many departments of the University.

NON-FLORIDA FEE SCHOLARSHIPS (these do not take care of registration fees) are available to a limited number of graduate students. Awards are made on the basis of scholarship achievement.

ONE-THIRD-TIME ASSISTANTSHIPS provide a stipend from $2,250 to $2,650 for nine months plus waiver upon request of out-of-state fees of $450. An academic year of graduate residence may be completed in 4 quarters. Fifteen hours per week are devoted to duties in teaching or research. Registration is limited to 12 credits. Assistants may be employed for either nine or twelve months.

ONE-HALF-TIME ASSISTANTSHIPS provide a stipend from $3,000 to $3,400 for nine months plus waiver upon request of out-of-state fees of $450. A year of graduate residence may be completed in 5 quarters. Assigned duties may amount to 20 hours per week. Registration is limited to 10 credits.

Interested students should inquire at their departmental offices concerning the availability of assistantships and the procedure for making application. Prospective students should write directly to the chairmen of their major departments as well as to the Admissions Office. *Early inquiry is essential in order to be assured of meeting application deadlines.* Appointments are made on the recommendation of the department chairman, subject to admission to the Graduate School and to the approval of the Dean of the Graduate School. Clear evidence of superior ability and promise is required. Reappointment to assistantships requires evidence of continuation of good scholarship.

### UNITED STATES STEEL FOUNDATION FELLOWSHIPS

One two-year fellowship with stipend of $4,800 for study in English language and literature is available.

### NATIONAL DEFENSE EDUCATION ACT FELLOWSHIP

TITLE IV NDEA FELLOWSHIPS.—The University is approved for the award of NDEA Title IV Fellowships through a large number of departments. These are three-year fellowships with stipends ranging from $2,000 to $2,400 for nine months and with $400 dependency allowances. Apply to the appropriate department by February 15th. Summer stipends of $400 are also available.

TITLE VI NDEA FELLOWSHIPS, PROGRAM B.—These are available for students whose proposed programs emphasize the learning of either Spanish or Portuguese through courses in the language or, in the case of doctoral candidates working on the dissertation, through research dealing with the language or research in which the language is an indispensable tool. Fellows are expected also to study other fields needed for a fuller understanding of the area, region, or country in which such language is commonly used. These related studies may include such fields as anthropology, economics, geography, history, linguistics, literature, political science, and sociology.

The basic stipend will comprise the cost of tuition and all required fees, plus $450 for summer study only, or $2,250 for the academic year, or $2,700 for summer and academic year. A candidate may apply for an allowance for up to four dependents. The allowance for each dependent is $600 for three quarters.

### NATIONAL SCIENCE FOUNDATION GRADUATE TRAINEESHIPS

Doctoral Programs: NSF Graduate Traineeships are available in the following fields: Aerospace Engineering, Anthropology, Bioenvironmental Engineering, Botany, Chemical Engineering, Chemistry, Civil Engineering, Economics, Electrical Engineering, Engineering Science and Mechanics, Geography, Industrial and Systems Engineering, Mathematics, Mathematical Statistics, Mechanical Engineering, Medical Sciences, Metallurgical Engineering, Nuclear Engineering Sciences, Physics and Astronomy, Political Science, Psychology, Sociology, and Zoology. Trainees are eligible for reappointment for a second year for the master's degree and for up to four years for the doctorate.

Stipends include $2,400 to $2,800 plus out-of-state tuition of $600 and registration fees of $400 for 12 months plus $500 for a dependent spouse and each dependent child.

### NASA PREDOCTORAL TRAINEESHIPS IN SPACE SCIENCE AND TECHNOLOGY

Doctoral Programs: NASA Traineeships are available in the following space-related fields: Aerospace Engineering, Animal Science, Bacteriology, Bioenvironmental Engineering, Botany, Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Engineering Science and Mechanics, Mathematics, Mechanical Engineering, Medical Sciences, Metallurgical Engineering, Nuclear Engineering Sciences, Physics and Astronomy, Psychology, and Zoology. Trainees are assured of three years of support if they maintain normal progress toward a degree.

Stipends include $2400 plus out-of-state tuition of $600 and registration fees of $400 for 12 months plus $400 per dependent with maximum dependency allowance of $1000.

### NDEA-RELATED FULBRIGHT-HAYS GRADUATE FELLOWSHIPS FOR STUDY ABROAD

The purpose of this program is to enable graduate students who plan to teach in U. S. institutions of higher education to undertake non-Western language and area study and research abroad.

In general, fellows will be expected to study in the world area of their academic interests during their periods abroad, and fellows following a full-time program of formal study will normally be expected to carry on their studies in a single country. In certain cases, however, approval may be given for dissertation research which would involve (a) visits to several countries, or (b) study outside the geographic area involved if it is demonstrated that specialized or superior research facilities exist elsewhere.

Stipends will be individually computed. The minimum amount allowed for maintenance will be $225 per month; this may be adjusted upward, depending on the local cost of living. The award will also cover fees for tuition which the fellow may need to carry out his approved program; and an allowance may be made to help the fellow meet the cost of research and incidental expenses.

Dependency allowances will be provided for up to four dependents and will vary according to the length of the award. For awards of 6 months or less, the allowance will be $60 per month for each dependent; for awards of more than 6 months, the allowance for the first dependent will be at the rate of $150 per month; allowances for up to three additional dependents will be at the rate of $100 each per month.

### PEACE CORPS AWARDS

In encouraging Peace Corps returnees to pursue an advanced degree, the Graduate Council has designated two fellowships for 1967-68 which will be held for Peace Corps applicants until it is clear that well-qualified applicants from the Corps are not likely to become available.

### LOANS

National Defense Student Loan Program.—The National Defense Student Loan program provides loans up to $1,000 per year, with interest at 3 per cent beginning one year after graduation and repayable over a period as long as ten years. Application should be made to the Office of the Dean of Student Affairs, University of Florida.

University Loans.—Other university loans are also available to graduate students who are within two years of their terminal degree.

# SPECIAL PROGRAMS AND FACILITIES

## PROGRAMS

### LATIN AMERICAN STUDIES

The Center for Latin American Studies is the University agency responsible for directing or coordinating graduate training, research and other academic activities related to the Latin American area.

#### GRADUATE DEGREE PROGRAMS

MASTER OF ARTS IN LATIN AMERICAN STUDIES.—This is an interdisciplinary area degree offered directly by the Center. Requirements are: (a) a major of at least 21 credits consisting primarily, if not exclusively, of Latin American language or area courses in one department, which may be agricultural economics, anthropology, economics, foreign languages (Spanish and Portuguese), geography, history, library science, political science and sociology; (b) at least 15 credits of Latin American language and/or area courses in at least two other departments; (c) a thesis on a Latin American topic for which up to 9 credits are given through registration in LA 699; (d) a reading, writing and speaking knowledge of a Latin American language. The M.A. in Latin American Studies is intended primarily as a terminal degree for persons who initially in their graduate program are not aiming at a teaching career in traditional academic departments but who require a broad knowledge of Latin American cultures and appropriate language competence for their career objectives. It is so structured, however, that students may move directly from it into departmental Ph.D. programs without interrupting or slowing down their academic progress.

*Departmental M.A. degrees.* Requirements are: (a) at least 30 credits of work in the major department; (b) a 9-credit minor in another department; (c) a thesis for which 9 credits are given; (d) a reading knowledge of a foreign language. Through agreement with the Center, the departments named in the preceding paragraph permit a Latin American concentration in the major and minor fields, a thesis on a Latin American topic, and the use of a Latin American language to satisfy the language requirement.

*The Ph.D. degree.* The Center does not offer an interdisciplinary Latin American area degree at the doctoral level. Through agreement with participating departments, however, it does provide a Certificate in Latin American Studies which is awarded in conjunction with Ph.D. degrees in agricultural economics, economics, geography, history, political science, sociology and Spanish. Requirements for the certificate are: (a) Latin American concentration within the major department; (b) an area minor of at least 30 credits consisting principally, if not exclusively, of Latin American language and area courses in two or more departments outside the major and including at least 5 credits of LA 640, LATIN AMERICAN AREA SEMINAR; (c) a dissertation on a Latin American subject; (d) a reading, speaking and writing knowledge of one Latin American language and a reading knowledge of another; (e) residence in Latin America normally of at least six months duration and devoted primarily to dissertation research.

*Graduate Fellowships and Assistantships.* N.D.E.A. Title VI Latin American Language and Area fellowships, N.D.E.A. Title IV fellowships (in Agricultural Economics, History, Political Science, and Spanish), and University fellowships and assistantships are available on a competitive basis to students in the degree programs described above.

### RESEARCH

The Center supports or participates in a number of interdisciplinary research programs which, in addition to their primary objectives, provide opportunities for training and financial support of graduate students.

### LIBRARY RESOURCES

The several libraries on the campus of the University of Florida have Latin American holdings totaling over 90,000 volumes as well as important manuscript materials in the original, in transcription or on microfilm. In terms of subject, holdings are strongest in history and the social sciences but increasing attention is being given to the environmental sciences and to literature. In terms of region, they are strongest in the Caribbean and circum-Caribbean but Brazilian materials are being augmented rapidly.

### OTHER ACTIVITIES

The Center sponsors conferences on Latin American topics and problems; supports publication of scholarly books, monographs and papers; and cooperates with other University units in organizing and conducting developmental type programs in Latin America.

INQUIRIES ABOUT THE VARIOUS PROGRAMS AND ACTIVITIES OF THE CENTER SHOULD BE ADDRESSED TO: THE DIRECTOR, CENTER FOR LATIN AMERICAN STUDIES, 450 LIBRARY, UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA 32601.

## BIOLOGICAL SCIENCES

The Division of Biological Sciences is organized on a cross-college basis to provide stimulation and coordination in the Biological Sciences. The Division has organized faculties, with staff from many disciplines in the several colleges, in Cellular and Molecular Biology, Genetics, Developmental Biology, Parasitology, Marine Biology and Radiation Biology. Each faculty is responsible for developing and supervising a core program in its special area. In addition to the cross-college programs, the Division serves to coordinate biological science wherever it exists in the University. The departments of Zoology and Marine Science in Arts and Sciences, Botany and Bacteriology in Agriculture, and Biological Science in the University College are specifically designated as administratively responsible to the Division of Biological Sciences.

## STATE CENTERS FOR CONTINUING EDUCATION IN ENGINEERING

The College of Engineering through its continuing education program has established off-campus centers to offer course work applicable to the Master of Engineering degree (see page 20). Centers are presently located in Duval County, Escambia County, and Palm Beach County.

Students who have been admitted to the Graduate School of the University of Florida may enroll in courses offered at these State Centers as part of a planned program toward the Master of Engineering degree. Other students may take the courses offered at these centers provided they are admitted to the University of Florida.

### GENESYS

The 1963 Florida Legislature appropriated funds for the College of Engineering to establish a graduate education program in the east central part of the state aimed primarily to meet the needs of employed engineers and scientists. In formulating the program the college established extensions of its campus at Cape Kennedy, Orlando, and Daytona Beach. These campuses have been constructed and are interconnected with each other and the Gainesville campus by closed circuit television with special features adapted to classroom instruction. Additional television terminals are located at NASA-MILA on Merritt Island and on the Orlando Air Force Base. There are resident faculty representing several engineering disciplines located at each of these campuses.

The admission requirements for regular graduate status for this program are the same as for the Gainesville campus. Special programs are arranged for students with deficiencies. While the class schedules are arranged to enable fully employed persons to receive instruction, full-time students may attend on any of the campuses.

### TRAVELING SCHOLAR PROGRAM

The State University System affords, under the Traveling Scholar Program, an opportunity for graduate students to take course work or conduct research activities at any of the universities in the State System. The course work taken under the auspices of the Traveling Scholar Program at another university in the System will apply for graduate degree credit at the student's home campus. The deans of the graduate schools of the State universities are the coordinators of the Program. For details regarding the Program and for approval to participate in it, students must apply to the dean of the graduate school on their home campus.

### PUBLIC ADMINISTRATION

Graduate work is offered leading to various fields of public employment. Three training sequences are outlined herein:

*Management Sequence.*—Adviser for the major field is in the Department of Political Science. Training in this area leads to positions in city manager government and meets state and federal civil service requirements. The major will be a concentration of public administration courses within the field of political science. A minor or minors may be taken in economics (concentration in public finance), accounting, or other areas.

*Governmental Planning Sequence.*—Adviser is in the Department of Political Science. Training in this area is offered leading to positions in local, state, and federal government planning agencies. The curriculum consists of seminars in planning, public administration and public law and recommended

courses in statistics, economics, sociology, geography, or agricultural economics. Supervised summer internships in selected planning agencies in Florida are arranged by the department as an integral part of the training program.

All sequences will include 45 credits of work and a thesis. The major is 18 to 27 credits and the minor is 8 to 18 credits, at least 8 of which must be in one field. The thesis normally covers 9 credits of research.

### URBAN PROBLEMS

A comprehensive curriculum concentrating on urban problems, leading to the Ph.D. degree, is offered through the Department of Political Science. Four fields in political science are specified for this curriculum: public administration, American government (including national as well as local government, parties, and political behavior), public law, and either political theory or comparative government. The fifth field is in the minor and may be taken in either economics or sociology. Certain courses in methodology are required, such as PCL 613 and statistics. All other requirements, such as languages, remain the same as for the regular Ph.D. in political science.

### INTERNATIONAL RELATIONS

Specialization in international relations leading to the M.A. and Ph.D. degrees is offered in programs through the Department of Political Science. In addition to the M.A. and Ph.D. with major in political science which may emphasize international relations (see page 124 of this *Catalog*), the University offers an M.A. and Ph.D. with a major in international relations. For the M.A. the requirements are the same as for the M.A. in political science. For the Ph.D. three fields of political science (plus two graduate courses in a fourth field) and two minor fields are required. All other requirements, such as language, remain the same.

### MASTER'S DEGREES FOR JUNIOR COLLEGE TEACHERS OF TECHNOLOGY

Programs are offered cooperatively between the College of Education and the College of Engineering, and between the College of Education and the departments of Architecture and of Building Construction in the College of Architecture and Fine Arts. Their intent is to supply competent teachers for the many terminal two-year technology programs being offered both in this state and in other states.

Generally speaking, a person with a prior degree who has a working knowledge of calculus and college-level physics can complete this degree program in one calendar year. If the prospective student is uncertain of his proficiency in these areas, proficiency can be regained through enrollment in a quarter prior to his embarking upon the master's degree program.

*Admission Requirements.*—Applicants must meet the admission requirements of the Graduate School and the College of Education. Generally speaking, applicants must have a baccalaureate degree from an approved college or university and must have a grade point average of at least 2.5 on a 4.0 system during their junior and senior years. The Aptitude Test of the Graduate Record Examination is used as a basis for selection.

*Curriculum.*—The curriculum is a non-thesis program with a minimum requirement of 50 credits. The student must satisfy the master's degree requirements of the college from which he expects to recive the degree. The general pattern of all programs includes from 16 to 32 credits of education and 16 to 32 credits of work in the technical specialty. An individual program will depend upon previous background and experience.

### FORD FOUNDATION THREE-YEAR MASTER'S PROGRAM

*Ford Foundation Undergraduate-Graduate Program.*—The Foundation has made a fellowship grant to the University of Florida for the initiation of a three-year master's degree program in the Graduate School. The program will begin with the junior year and normally continue through the first year of graduate study. Students who maintain satisfactory progress will be awarded a fellowship or assistantship for the *third or final year,* and will receive both the bachelor's and master's degrees. Program fellowships up to $220 per month and cancellation of non-Florida fees (but not registration fees) for the first year of graduate study will be available. For further details, contact Dean Robert A. Bryan, 235 Tigert Hall.

### RESEARCH PROGRAM THROUGH THE OAK RIDGE ASSOCIATE UNIVERSITIES

The University of Florida is one of the sponsors of the Oak Ridge Associated Universities located at Oak Ridge, Tennessee. Through this sponsorship our graduate research program has at its disposal all the facilities of the Oak Ridge National Laboratory, the Medical and Special Training Divisions of the Oak Ridge Institute of Nuclear Studies, the Atomic Energy Commission—University of Tennessee Agricultural Research Laboratory, and the research staffs of these laboratories. When a candidate has completed one year (two for the Ph.D.) of his resident work, it is possible, by special arrangement, for him to go to Oak Ridge to work towards completion of his research problem and the preparation of his thesis. In addition, it is possible for the staff members of this University to go to Oak Ridge for varying periods, usually not less than three months, for advanced study in their particular field. Both staff and students are kept abreast of the most modern and up-to-date developments in atomic and nuclear research in progress at the Oak Ridge laboratories.

The students who go to Oak Ridge hold Oak Ridge Graduate Fellowships, which have varying stipends determined by the number of their dependents and their level of work. Staff members may work at Oak Ridge on stipends commensurate with their present salaries.

A copy of the bulletin and announcement of the Graduate Training Program of the Oak Ridge Institute of Nuclear Studies is available in the Office of the Graduate School. Bulletins may also be obtained by writing to the Chairman of the University Relations Division of the Oak Ridge Institute of Nuclear Studies, Box 117, Oak Ridge, Tennessee. Interested persons should ask for assistance from Dr. Billy G. Dunavant, Oak Ridge Institute of Nuclear Studies Counselor at the University of Florida.

All arrangements for these fellowships will be made between the Dean of the Graduate School and the Institute of Nuclear Studies.

# FACILITIES

## UNIVERSITY OF FLORIDA LIBRARY SERVICE

The library system consists of two major central units, the Research Library and the College Library. There are, also, several libraries serving the various academic colleges and schools. The holdings of the libraries number over 1,160,000 cataloged volumes and a large number of uncataloged documents and newspapers.

The reference and bibliography collection, which includes the basic bibliographies, abstracting and indexing services, and catalogs of other libraries, is located on the first floor of the Research Library, where there are librarians available for consultation and assistance. Among the special collections in the Research Library are the Rare Book Collection, the Dance-Music-Theatre Archives, the P. K. Yonge Library of Florida History, the Marjorie Kinnan Rawlings Collection, which consists of manuscripts, typescripts, and memorabilia of one of America's distinguished novelists, and the Collection of Creative Writing, which includes work sheets, manuscripts, and other literary papers of significant contemporary American and British authors. In recent years, special emphasis has been placed upon strengthening the holdings for the Latin American Area Studies Program, especially for the West Indies and the Caribbean areas.

The system also includes libraries for the Colleges of Architecture and Fine Arts, Education; Engineering; Physics and Astronomy; Law; the Institute of Food and Agricultural Science; the units comprising the J. Hillis Miller Health Center; Chemistry; and the P. K. Yonge Laboratory School. In addition, reading room facilities have been provided in Journalism and Communications, in Health and Physical Education and in the dormitory areas.

The *Library Handbook* provides helpful information on hours, loan periods, and special services.

## FLORIDA STATE MUSEUM

The Florida State Museum was created by an act of the Legislature in 1917 as a department of the University of Florida. Through its affiliation with the University it carries the dual responsibility of the State and University Museum.

The Museum operates as a center of research in anthropology and natural history. Its accessory functions as an educational arm of the University are carried forward through interpretive displays and scientific publications. Under the administrative control of the director are the three departments of the Museum: Natural Sciences, staffed by scientists and technicians concerned with the study and expansion of the research collections of animals; Social Sciences, whose staff members are concerned with the study of historic and prehistoric cultures; Exhibits, staffed by specialists in the interpretation of knowledge through museum exhibit techniques.

The Museum exhibition halls occupy the first two floors of the Seagle Building, a ten-story office building located in downtown Gainesville, nine blocks from the campus. These halls are open to the public from nine-thirty until five o'clock every day except Sundays and major holidays, when they

are open from one to five o'clock. There is no admission charge. The Museum is frequently used by University and public school classes and is visited by over 75,000 persons annually.

Occupying three additional floors in the Seagle Building and other space on campus, the research collections now total approximately one million items. These collections are under the care of curators who encourage the scientific study of the Museum's holdings. Materials are constantly being added to the collection both through gifts from friends and through collecting by staff members. The archaeological collections are noteworthy. There are also extensive study collections of birds, mammals, insects, mollusks, reptiles, amphibians, fish, and vertebrate fossils. The latter seven collections are cooperatively maintained by the Museum and Department of Zoology. The collection of invertebrate fossils is maintained in cooperation with the Department of Geology. Opportunities are provided for students, staff, and visiting scientists to use the collections. Field work is presently sponsored in the archaeological, paleontological, and zoological fields.

### THE UNIVERSITY CENTER OF THE ARTS

The University Center of the Arts serves students, faculty, and the general public by presenting exhibitions and performances of the best works in the visual and performing arts.

### THE UNIVERSITY GALLERY

The University Gallery is an integral part of the new Architecture and Fine Arts complex, which opened in January, 1965. The Gallery is located on the campus facing south 13th Street (or U. S. 441). An atrium and a reflecting pool are two pleasing features of the Gallery's distinctive architectural style. The Gallery, with 3000 square feet of display space, is completely modern, air-conditioned, and maintains a varied exhibition schedule of the visual arts during the year. The contents of exhibitions displayed in the University Gallery range from the creations of traditional masters to the latest and most experimental works by the modern avant garde. The minor arts of yesterday and today, along with the creations of oriental and primitive cultures, form topics for scheduled exhibitions. The Gallery originates one or two of the major exhibitions during the year. Each exhibition shows for approximately a month, and the Gallery's hours are from 10 A.M. to 5 P.M. daily except Sunday, when they are from 1 P.M. to 5 P.M. The Gallery is closed on Mondays, holidays and during the month of August.

### THE TEACHING GALLERY

The Teaching Gallery of the Department of Art is located adjacent to the department's office area, on the third floor of the new Classroom Building in the College of Architecture and Fine Arts complex. As a direct and physical adjunct to the Art Department's teaching program, this Gallery displays smaller traveling exhibitions of merit, as well as one-man shows by faculty artists and student exhibitions. The Gallery is open Monday through Friday

from 9 A.M. to noon and from 1:30 P.M. to 5 P.M. It is closed Saturdays and Sundays.

## COMPUTING CENTER

The Computing Center of the University provides the services of IBM System/360 Model 50 and 1401 electronic computers, a 563 Calcomp Plotter, and other subsidiary equipment.

The principal functions of the center are:

1. To aid research by furnishing consulting services and computing support for the faculty, staff, graduate students, and others.
2. To provide computing support for undergraduate and graduate classes.
3. To maintain a library of computer programs for the benefit of users.
4. To carry on investigations in the theory and application of numerical analysis.
5. To conduct research under contract or other arrangements for university, federal, state, and other government agencies, as well as for foundations and individuals.
6. To assist in coordinating and developing University research programs in which the computer may be involved.
7. To provide machine computation and tabulating facilities for other educational and research units of the University.

The Computing Center is primarily a research unit, though members of the staff may teach courses in other departments. Thesis work may be carried on in the Center.

## UNIVERSITY OF FLORIDA PRESS

The purpose of the University Press is to encourage, seek out, and publish original and scholarly manuscripts which will aid in developing the University as a recognized center of research and scholarship.

In addition to its broad range of state, regional, and Latin American titles, the Press publishes books of general interest, and ten separate series: biological sciences, Caribbean conferences, dance literature, Floridiana facsimile and reprint, Latin American gateway, geronotology, humanities, Latin American, medical sciences, and social sciences. It is also the publisher of *The Handbook of Latin American Studies,* sponsored by the Library of Congress, and is the distributor throughout the United States and Canada of the publications of the Caribbean Commission and of the Inter-American Bibliographical and Library Association.

The Press Board of Managers, including the director and nine faculty experts appointed by the President of the University, determines policies of publication relating to the acceptance or rejection of manuscripts and the issuance of author contracts. Each year the board examines numerous manuscripts submitted not only by the University faculty but by authors from all over the United States, Europe, and Latin America.

The Press is a member of the Association of American University Presses.

Students and members of the faculty and staff are cordially invited to visit the Press offices at 15 N.W. 15th Street, adjacent to the campus.

### UNIVERSITY OF FLORIDA MONOGRAPH SERIES

The Graduate School sponsors two monograph series devoted to the publication of research primarily by present and former members of the scholarly community of the University. The *Social Sciences Monographs* are published four times each year with subjects drawn from anthropology, economics, history, political science, sociology, education, geography, law, and psychology. The *Humanities Monographs* are published three times each year with subjects drawn from art, history, language and literature, music, philosophy, and religion.

## ORGANIZED RESEARCH

The *Division of Sponsored Research* has two general functions: (1) the administration and promotion of the Sponsored Research Program and (2) the support of the total research program of the University in a manner which produces maximum benefit to the University and the greatest service to the State of Florida. All proposals for the sponsorship of research, grants-in-aid, or training grants must receive the approval of the Director of Research. Subsequent negotiations with potential contracting agencies or sponsors of research projects are carried on under the Director's supervision.

The activities of the Division of Sponsored Research are intended to stimulate growth and to assist in expanding a balanced research program throughout the University. These activities are intimately related to the support of the graduate program. They are also intended to relieve principal investigators and departments of many of the detailed administrative and reporting duties connected with some sponsored research. The duties and responsibilities of the Division, of course, do not infringe upon the prerogative of the principal investigator to seek sponsors for his own projects nor upon the responsibility of the researcher for the scientific integrity of a project. In direct contacts between a principal investigator and a potential sponsor, however, prior clearance should be obtained from the Division to insure a uniformity in contract requirements and to avoid duplication of negotiations with the same sponsor.

The Division of Sponsored Research is administratively responsible to the Vice President for Academic Affairs. Policies and procedures for the operation of the Division are developed by a Board of Directors working with the Director of Research within the general framework of the administration, policies, and procedures of the University. The Research Council serves as adviser on scientific matters. The Dean of the Graduate School and the Graduate Council serve as advisers on matters relating to the graduate program.

*The Agricultural Experimental Stations* are responsible for research leading to the improvement of all phases of Florida's widely varied agricultural production, processing, and marketing. The stations are administered by the director located on the University of Florida campus and include main station departments as well as branch stations and field laboratories operating as an integral administrative unit. As a statewide agency having agricultural research as its primary objective, the stations cooperate closely with numerous Florida agricultural agencies and organizations.

Many members of the research staff of the Agricultural Experiment Stations are also members of the faculty of the College of Agriculture as are some in the Agricultural Extension Service. These three agricultural units of the University of Florida Institute of Food and Agricultural Sciences work cooperatively in many areas under the administration of the Provost for Agriculture.

Funds for research assistants are made available to encourage graduate training and professional scientific improvement.

Research at the main station is conducted within 17 departments—Agricultural Economics, Agricultural Engineering, Agronomy, Animal Science, Botany, Dairy Science, Entomology, Food Science, Forestry, Fruit Crops, Ornamental Horticulture, Plant Pathology, Poultry Science, Soils, Statistics, Vegetable Crops, and Veterinary Science. In addition to the above, the main station has three units vital to its research programs; namely, Editorial, Field Services, and Plant Science Section.

The branch stations and field laboratories, and their locations, are as follows: Central Florida Station, Sanford; Citrus Station, Lake Alfred; Everglades Station, Belle Glade; Gulf Coast Station, Bradenton; North Florida Station, Quincy; Range Cattle Station, Ona; Sub-Tropical Station, Homestead; Suwannee Valley Station, Live Oak; West Florida Station, Jay; Indian River Field Laboratory, Fort Pierce; Plantation Field Laboratory, Fort Lauderdale; South Florida Field Laboratory, Immokalee; Potato Investigations Laboratory, Hastings; Big Bend Horticultural Laboratory, Monticello; Strawberry and Vegetable Field Laboratory, Plant City; and the Watermelon and Grape Investigations Laboratory, Leesburg; West Florida Dairy Unit, Chipley; and Marianna Unit, Marianna.

The Florida Agricultural Experiment Station is cooperating with the Brooksville Beef Cattle Research Station, Brooksville, a USDA field laboratory, in its beef cattle and pasture production and management programs; and with the United States Weather Bureau, Lakeland, in the Federal Frost Warning Service for fruit and vegetable producers and shippers.

*The Florida Engineering and Industrial Experiment Station* is not only the research division of the College of Engineering, but it is also the developmental laboratory for the industries of the state. It was officially established in 1941 by the Legislature as an integral part of the College of Engineering "to organize and promote the prosecution of research projects of engineering and related sciences, with special reference to such of these problems as are important to the industries of Florida."

The facilities of the Station include all the equipment of the College of Engineering, now valued at more than 4.5 million, not including government-owned equipment. The Station also has available for its use the laboratories, staff, and facilities of other divisions of the University. Because of the close relationship between teaching and research activities, students secure much information about engineering and industrial problems normally not encompassed in a collegiate program.

The Station receives only a small portion of its operating revenue from the state. The remainder is derived from contracts with governmental agen-

cies, foundations, and industrial organizations. Large and small manufacturers avail themselves of the finest research laboratories in the Southeast. Among the outstanding laboratories, in addition to a well-equipped shop, are those in aerospace engineering; chemical engineering; public health engineering; systems engineering; electronics; ionics; metallurgy; ceramics; air conditioning; soil mechanics; solar energy; electrical machinery; paper, pulp and wood products utilization; farm mechanization; corrosion; aircraft model wind tunnel; reinforced and prestressed concrete; coastal engineering; and nuclear engineering facilities including reactor, sub-critical assembly, pulsed neutron source, linear accelerator and cobalt source.

*The Bureau of Architectural and Community Research* is one of the activities of the College of Architecture and Fine Arts. It was established to conduct and coordinate research in the design, construction, and maintenance of buildings, particularly under conditions existing in Florida, and the design and development of Florida communities. It also fosters and encourages research in all areas of the building arts and the fine arts, including sociological and psychological aspects as well as physical evaluations.

*The Bureau of Economic and Business Research* is the research division of the College of Business Administration. A part of the Bureau's work is designed to further understanding of the economy of Florida and the Southeast. Economic, business, and related research supported by grant and contract funds is undertaken in subject areas of interest to the faculty. Graduate students are involved also in these projects.

The Bureau publishes two monthly periodicals: *Dimensions* and *Economic Leaflets*. Through these publications and monographs, the Bureau disseminates the results of research and information gained from continuing statistical series on personal income, population, construction, retail sales, employment, and the activities of commercial banks and savings and loan associations.

The *Public Administration Clearing Service* is a research and service adjunct of the Department of Political Science in the College of Arts and Sciences. It carries on a continuous program of research on public administration, political behavior, and public policy in Florida; it provides consulting services on a contract basis to state and local governments in Florida; it publishes research studies and surveys of administrative and political problems in both scientific and popular monograph form and it publishes a *Civic Information Series* annually for assistance to citizen groups in their study of current issues in the state.

*The Institute of International Relations* is a research agency administered through the Department of Political Science to conduct studies in international relations.

*The Research Division of the School of Journalism and Communications* conducts research in the news media, in broadcasting, advertising, and public opinion.

## STUDENT SERVICES

The Office (International Center) of the *Foreign Student Adviser* is the center of services performed in behalf of the foreign students from the time

of receiving their initial inquiries until they return home. The office coordinates action with other university agencies and is charged with responsibilities involving admissions, reception, orientation, housing, finances, health, immigration, academic counseling, petitions, practical training, employment, embassy and foundation reports, correspondence, legal problems, life counseling and community relations. The adviser also serves as Fulbright Program Adviser and Peace Corps and VISTA contact for volunteers. Foreign faculty members receive assistance also.

*The University Placement Service* functions as the central placement agency for the campus with services available to all students and alumni of the University; and it works in conjunction with the schools and colleges who give direct assistance to their graduates.

In cooperation with educational and administrative units, counseling and testing services, and other related functions, the placement service makes its contribution to the development of the whole individual. Its primary aim is to offer assistance to students, from the time they enter school until they graduate, in the development of vocational goals and attainment of their first career position. Assistance is also offered to alumni who have attended graduate school elsewhere, who are returning to civilian life from the military, or those desiring to make changes in employment.

Functions include: (1) serving as liaison between students and business, industrial, governmental, and educational organizations that are seeking college trained personnel for permanent employment; (2) establishing and maintaining records on registrants, employment opportunities, and placement results; (3) conducting studies on the employment outlook, salary trends, progress of graduates in the working world, and related matters; (4) assisting students who leave school before graduation and, also, assisting students in finding summer jobs which relate to their fields of study and employment goals; (5) serving in a public relations capacity in dealing with employers and the public.

Specific services include: career planning and guidance; counseling on the tools and techniques of the job search; arranging interviews between employers and students; providing personnel records and faculty ratings on students to employers; preparing and mailing lists of job opportunities to registrants; distributing recruitment booklets and materials; and administering tests for employers.

These services are available to any student or alumnus without charge.

*The University Counseling Center* provides psychological services to the members of the student body and consultative services for the University staff members who are engaged in counseling relationships with University students. It also provides practicum experience for graduate students in the departments of Psychology and Personnel Services. It engages in institutional as well as basic research in the problems of counseling. Specific services include vocational counseling, personal counseling, marriage counseling and problems of the underachiever. In these functions the University Counseling Center works closely with staff in the residence halls and with the academic advisers

in the University College and upper division colleges. The Center works with the University Mental Health Service on a referral basis and with the director of the early registration program in the orientation of prospective students to the program of the University.

*The Student Health Department* strives to prevent the entry and spread of communicable diseases at the University. The following immunization innoculations are required: (1) smallpox, within 5 years; (2) tetanus toxoid, a booster within 2 years; (3) poliomyelitis, either (a) Salk vaccine with a booster within 2 years or (b) oral vaccine. No exceptions are made to this ruling. Innoculations should be accomplished prior to registering at the University.

Applicants for admission to the University receive a form for medical history and physical examination from the Registrar's Office. The history should be completed by the applicant before he goes to his physician for physical examination. The physical examination portion must be completed by a licensed doctor of medicine (M.D.) and the form mailed by the doctor directly to the Director, Student Health Department, University of Florida, Gainesville, Florida, in the envelope supplied for that purpose. The medical history and physical examination information is then reviewed by a physician before the applicant is cleared for registration at the University. (For additional information see the *Undergraduate Catalog.*)

*The Speech and Hearing Clinic,* Room 321, Tigert Hall, offers its services without charge to any University student who has an impairment in speech or hearing. This assistance is available at any time during the year and therapy sessions are adjusted to the schedule of the student. Professional referrals are not necessary. The student is encouraged to visit the Clinic and to take advantage of its services.

*Graduate School Editorial Service* aids in the preparation of the thesis or dissertation which is one aspect of the training in the mature and responsible scholarship expected of a candidate. The following policies and procedures apply to the Graduate School's editorial services for students:

1. The responsibility for acceptable English in a thesis is principally the Supervisory Committee's.
2. The Graduate School staff acts in an advisory capacity. It informs the student concerning acceptable form (not content) for a thesis. The staff spot checks each thesis for typographical errors, proper footnote form, pagination, and general mechanics.
3. The Graduate School staff can advise a student concerning proper grammar, sentence structure, and correct word usage only to the extent of correcting a few pages.
4. If the student will appear in the Graduate School Office with his rough draft, the staff will examine a limited portion of it; and, if it appears that the student is not in control of the English language, the student's supervisory committee chairman will be so notified by letter. The chairman then may elect to help correct the student's English; or, if the student is foreign, the chairman may advise the student to seek expert advice concerning English.

*Courses of Instruction*

COLLEGE OF AGRICULTURE
SCHOOL OF FORESTRY

COLLEGE OF ARCHITECTURE AND FINE ARTS

COLLEGE OF ARTS AND SCIENCES
SCHOOL OF JOURNALISM AND COMMUNICATIONS

DIVISION OF BIOLOGICAL SCIENCES

COLLEGE OF BUSINESS ADMINISTRATION

COLLEGE OF EDUCATION

COLLEGE OF ENGINEERING

COLLEGE OF HEALTH RELATED PROFESSIONS

COLLEGE OF MEDICINE

COLLEGE OF NURSING

COLLEGE OF PHARMACY

COLLEGE OF PHYSICAL EDUCATION AND HEALTH

# COLLEGE OF AGRICULTURE

AGRICULTURAL ECONOMICS

AGRICULTURAL ENGINEERING
(See COLLEGE OF ENGINEERING)

AGRONOMY

ANIMAL SCIENCE—GENERAL

ANIMAL SCIENCE

BACTERIOLOGY

BIOLOGICAL SCIENCES
(See BIOLOGICAL SCIENCES, Division of)

BOTANY

DAIRY SCIENCE

ENTOMOLOGY

FOOD SCIENCE

FRUIT CROPS

ORNAMENTAL HORTICULTURE

PLANT PATHOLOGY

POULTRY SCIENCE

SOILS

STATISTICS

VEGETABLE CROPS

VETERINARY SCIENCE

VOCATIONAL AGRICULTURE
(See "Agricultural and Extension" under COLLEGE OF EDUCATION)

# SCHOOL OF FORESTRY

# AGRICULTURAL ECONOMICS

## GRADUATE FACULTY 1966–67

TEFERTILLER, K. R., *Chairman;* ALLEGER, D. E.; BROOKE, D. L.; CAKE, E. W.; CLARK, H. B.; GREENE, R. E. L.; GREENMAN, J. R.; LANGHAM, M. R.; MCPHERSON, W. K.; MCPHERSON, W. W.; MURPHREE, C. E.; POLOPOLUS, LEO; SAVAGE, ZACH; SMITH, C. N.; SPURLOCK, A. H.; WILLIAMS, F. W.

Graduate study is offered leading to the degrees of Master of Agriculture, Master of Science and Doctor of Philosophy. Fields of study include farm economics and supply, demand and marketing, natural resources and factor markets, policy and economic development, world agriculture and trade, and econometrics. The department participates in the programs of the Center for Latin American Studies and the Center for Tropical Agriculture. Students who hold the bachelor's degree with their major field of study in an area other than agricultural economics should consult with the department chairman concerning acceptance for graduate study. In addition to the courses outlined, there are seminars for organized discussion of current topics and for review of graduate students' research.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

AS 501—SPECIAL TOPICS IN AGRICULTURAL ECONOMICS. 1 to 3 credits
Maximum 6 credits

AS 510—ECONOMICS OF FARM, GROVE AND RANCH MANAGEMENT. 3 credits

AS 520—MANAGEMENT OF AGRICULTURAL MARKETING FIRMS. 3 credits

AS 521—CASE STUDIES OF AGRICULTURAL MARKETING FIRMS. 3 credits

AS 522—ECONOMICS OF AGRICULTURAL HANDLING AND PROCESSING FIRMS. 3 credits

AS 530—ECONOMICS OF LAND USE AND DEVELOPMENT PLANNING. 5 credits

AS 550—COMPARATIVE AGRICULTURAL SYSTEMS. 3 credits

### GRADUATE COURSES

AS 600—PHILOSOPHY OF INQUIRY IN AGRICULTURAL ECONOMICS. 3 credits
Choice and formulation of problems; role of basic elements of inquiry in development of knowledge. Logic, observation, imagination, judgment; relation of ideas of leading philosophers to development of agricultural economics as a discipline.

AS 601—PROCEDURES IN PLANNING AND CONDUCTING RESEARCH. 3 credits
Concepts of research and the application of scientific methods in planning and conducting research in agricultural economics.

AS 602—PROBLEMS IN AGRICULTURAL ECONOMICS. 1 to 3 credits
Prerequisite: Consent of instructor. Individual study in selected problem areas in agricultural economics. Emphasis on aspects of problems of interest to the student and agreeable to the instructor. May be repeated with change in content up to a maximum of 6 credits.

AS 610—ECONOMICS OF AGRICULTURAL PRODUCTION. 3 credits
Prerequisites: ES 302, MS 302. Economic theory related to problems of producer choice at the firm level. Principles are generalized to the "n" input, "m" product and "t" time period case for various factor and product market structures. Estimation of production function and cost structures at the technical unit and firm level.

AS 611—Economics of Aggregate Output in Agriculture. 3 credits

Prerequisite: AS 610. Producer choices and consequences at the industry level. Supply of individual commodities and total agricultural output resulting from the aggregate behavior of producers and the relation of the production process to the welfare of society.

AS 612—Dynamics of Agricultural Production and Firm Growth. 3 credits

Prerequisite: AS 610. Dynamics of production and problems of firm growth. Effects of risk and uncertainty on the production process. Systems analysis and effect of adjustment restraints and time delays on producer behavior.

AS 620—Economics of Consumption and Demand for Farm Products and Marketing Services. 3 credits

Prerequisites: ES 302, MS 302. Application of theories of price, income and location to economics of consumption, household behavior and aggregate demand for agricultural products and related marketing services. Research applications and empirical models.

AS 621—Structure, Performance and Interdependencies in Agricultural Product Markets. 3 credits

Prerequisites: ES 301, AS 620 or consent of instructor. Application of economic theory to analysis of market structure and its impact on conduct and performance of the industry in relation to other sectors of the economy. Evaluation of effects of current public policy and institutional arrangements under which the marketing system operates.

AS 630—Agricultural Factor Markets. 4 credits

Prerequisites: ES 301, consent of instructor. Economic analysis of the aggregate supply and demand for the factors used in the farm sector of agriculture. Relation of demand for agricultural products to demand for factors of production; effects of technological change; allocation of factor returns and efficiency of factor markets.

AS 631—Land Tenure and Taxation in Agriculture. 4 credits

Prerequisites: AS 430, consent of instructor. Philosophy and history of property rights and taxation. Effects of property rights and taxes on factor employment, land use, output, land values, income distribution and social welfare.

AS 640—Foundations of Agricultural Policies. 3 credits

Prerequisite: AS 440 or consent of instructor. Analysis of policy-making processes. Interrelationships among economic, political and social goals, and actions which shape the institutional arrangements of the agricultural economy and its relations with other sectors.

AS 641—Agricultural Policies and Programs in the United States. 3 credits

Prerequisites: AS 440, ES 202. Theoretical and empirical treatment of relation between goals and programs. Effects of policies on volume and location of output, prices and income in the U. S. economy.

AS 642—Economic Development and Agriculture in Low-Income Economies. 3 credits

Prerequisites, ES 301, ES 302. Differential growth rates; structural interdependencies and relation of technology, knowledge, capital, population, natural resources, and institutional arrangements to economic growth and income distribution. Agriculture in low-income areas, especially Latin America, Asia and Africa.

AS 643—Development Planning and Policies in Low-Income Rural Economies. 3 credits

Prerequisite: AS 642. Institutional development in relation to factors affecting growth of the agricultural sector of low-income economies. Experiences in local, regional and national development planning in low-income economies.

AS 644—Regional Economics for Rural Areas. 3 credits

Prerequisites: ES 301, ES 302, consent of instructor. Location economics and models for regional economic analysis. Input-output, linear programming, and simulation techniques in regional economics; the role of planning in social accounting.

AS 646—Agriculture's Role in the Growth of Latin American Nations. 3 credits

Prerequisite: Consent of instructor. Agricultural developments in Latin America in relation to facts and theories of national growth, international relations and hemispheric understanding and cooperation.

AS 650—International Agricultural Policy and Trade. 3 credits

Prerequisite: ES 321. Trade theory applied to international movement of agricultural products, inputs, and prices. Analysis of international policies and programs affecting agriculture.

AS 660—Nonstochastic Econometric Models. 3 credits

Identical with ES 660. Prerequisite: Consent of instructor. Spatial equilibrium, input-output and game theory models. A review of the general linear programming model (and its basic theorems), integer, and nonlinear programming.

AS 661—Econometric Methods 1. 3 credits

Identical with ES 661. Prerequisites: STA 441, consent of instructor. Stochastic models. The general linear model and problems associated with its use in econometric research. Errors in variables, autocorrelation and miscellaneous single-equation problems.

AS 662—Econometric Methods 2. 3 credits

Identical with ES 662. Prerequisite: AS 661. A continuation of AS 661. The theory of the simultaneous equation approach, model construction, and estimating techniques.

AS 699—Master's Research. 0 to 9 credits. Maximum 24 credits

AS 799—Doctoral Research. 1 to 12 credits

# AGRONOMY

## GRADUATE FACULTY 1966–67

McCloud, D. E., *Chairman;* Edwardson, J. R.; Goddard, R. E.; Harris, H. C.; Horner, E. S.; Killinger, G. B.; Pfahler, P. L.; Rodgers, E. G.; Ruelke, O. C.; Schank, S. C.; Schroder, V. N.; Wallace, A. T.; West, S. H.; Wilcox, M.

The Department of Agronomy offers major work for the degrees of Master of Agriculture, Master of Science in Agriculture, and Doctor of Philosophy. Areas of specialization are crop ecology, crop nutrition and physiology, weed science, cytogenetics, genetics and plant breeding. Minor work is offered students taking major work in other departments. Students wishing to take either major or minor work in agronomy should consult departmental advisers.

*Prerequisites* to graduate training in agronomy include a background in science, with basic courses in mathematics, chemistry, physics, botany and bacteriology.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

AY 513—Oilseed Crops. 3 credits
AY 514—Fiber Crops. 3 credits
AY 536—Tropical Pasture and Forage Science. 3 credits

## GRADUATE COURSES

AY 641—Crop Nutrition. 3 credits
Prerequisite: BTY 310. Nutritional influences on differentiation, composition, growth and yield of agronomic plants.

AY 642—Biochemistry of Herbicides. 3 credits
Prerequisites: CY 402, CY 514, BTY 617 or consent of instructor. Mechanism of action, metabolism and structure-activity relationships of herbicides.

AY 644—Physiology of Agronomic Plants. 3 credits
Prerequisites: BTY 310, consent of instructor. The chemical organization, cellular constituents and organization and carbohydrate, lipid, protein and nucleic acid metabolism of agronomic plants.

AY 648—Crop Ecology. 3 credits
Prerequisites: AY 311, BTY 310 or consent of instructor. Influence and interaction of environmental factors, such as climatic, edaphic and biotic factors, on the growth and development of crops.

AY 649—Crop Adaptation and Distribution. 2 credits
Adaptation of crop plants to the environment as related to the intensive crop production belts of the world.

AY 658—Population Genetics. 3 credits
Prerequisites: AY 362, STA 520, consent of instructor. Application of statistical principles to biological populations in relation to gene frequency, zygotic frequency, mating systems and the effects of selection, mutation and migration on equilibrium populations.

AY 660—Cytogenetics. 5 credits
Prerequisites: Basic courses in genetics and cytology, and consent of instructor. The physical basis of genetic variability with emphasis on interrelationships of cytologic and genetic concepts. Laboratory demonstrates changes in chromosome structure and number, chromosomal aberrations, apomixis and application of cytogenetic principles.

AY 662—Advanced Genetics. 4 credits
Prerequisites: AY 362, AY 465 or AL 322. Advanced genetic concepts and modern genetic theory.

AY 664—Topics in Genetics. 2 to 4 credits
Identical with AL 664, BTY 696, PY 664, ZY 664. Prerequisites: AY 362 or ZY 325, consent of instructor. Biochemical, bacterial, viral, statistical, radiation, serological and human genetics; speciation, history of genetics, genetics of higher plants and genetics of higher animals. May be repeated with change of content up to a maximum of 12 credits.

AY 665—Advanced Plant Breeding. 4 credits
Prerequisites: AY 362, AY 465, STA 521, consent of instructor. An advanced study of the genetic basis for plant breeding procedures.

AY 682—Genetics Seminar. 1 credit
Current literature and developments in genetics. May be repeated with change of content up to a maximum of 3 credits.

AY 684—Graduate Agronomy Seminar. 1 credit
Current literature and studies of agronomic developments. Required of all

graduate students in Agronomy. May be repeated with change of content up to a maximum of 3 credits.

AY 686—Agronomic Problems. 1 to 3 credits

Prerequisite: Minimum of one undergraduate course in agronomy or plant science. Special topics for classroom, library, laboratory or field studies of agronomic plants. May be repeated with change of content up to a maximum of 9 credits.

AY 688—Topics in Agronomy. 2 to 4 credits

Prerequisite: Consent of instructor. Selected topics in specific agronomic areas will be critically reviewed. May be repeated with change of content up to a maximum of 12 credits.

AY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

AY 799—Doctoral Research. 1 to 12 credits

## ANIMAL SCIENCE—GENERAL

The three departments of animal, poultry and dairy sciences have combined their curricula into an Animal Science Curriculum. ADP 535 is a cross-departmental course taught by the staff of the three departments.

### COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

ADP 535—Animal Production in the Tropics. 4 credits

## ANIMAL SCIENCE

### GRADUATE FACULTY 1966–67

Cunha, T. J., *Chairman;* Ammerman, C. B.; Arrington, L. R.; Browning, C. B.; Carpenter, J. W.; Chapman, H. L.; Combs, G. E., Jr.; Crockett, J. R.; Davis, G. K.; Edds, G. T.; Feaster, J. P.; Harms, R. H.; Head, H. H.; Hentges, J. F., Jr.; Koger, M.; Marshall, S. P.; Moore, J. E.; Palmer, A. Z.; Shirley, R. L.; Wallace, H. D.; Warnick, A. C.; Wilcox, C. J.; Wilson, H. R.; Wing, J. M.

The Department of Animal Science offers the degrees of Master of Science in Agriculture or Doctor of Philosophy in the following areas: (1) animal nutrition, (2) meats, (3) animal breeding and genetics, and (4) animal physiology. A student may work on a problem covering more than one area of study. Large animals (beef cattle, dairy cattle, swine, poultry and sheep) and laboratory animals are available for various research problems. Adequate nutrition and meats laboratories are available for detailed chemical and carcass quality evaluations. Special arrangements can be made for conduction of research problems at the various branch agricultural experiment stations throughout Florida. A Ph.D. degree may be obtained in Animal Science with dissertation research under the direction of members of the Departments of Dairy Science and Poultry Science.

Departmental prerequisites for admission to graduate study include a sound science background, with basic courses in bacteriology, biology, botany and chemistry.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

AL 527—Animal Nutrition. 4 credits

## GRADUATE COURSES

AL 602—Quantitative Genetics. 5 credits
Prerequisites: STA 320, AY 329. Genetic and biometric principles underlying genetic characters that exhibit continuous variation.

AL 604—Meat Technology. 4 credits
The chemistry, physics, histology, bacteriology and engineering involved in the handling, processing, manufacturing, preservation, storage, distribution and utilization of meat.

AL 605—Experimental Technics and Analytical Procedures in Meat Research. 4 credits
Experimental design, analytical procedures; technics; carcass measurements and analyses as related to livestock production and meat studies.

AL 607—Physiology of Reproduction. 4 credits
Anatomy, histology and physiology of genital organs. Estrous cycle changes in the female. Semen production in the male and artificial insemination.

AL 609—Problems in Animal Science. 1 to 6 credits
May be repeated with change of content up to a maximum of 12 credits.

AL 650—Advanced Methods in Nutrition Technology. 4 credits
Prerequisite: CY 220. For graduate students but open to seniors by special permission. Demonstrations and limited performance of procedures used in nutrition research.

AL 651—Advanced Animal Nutrition. 3 credits
Prerequisite: CY 301. Proteins, carbohydrates, lipids, vitamins and enzymes.

AL 652—Advanced Animal Nutrition Laboratory. 3 credits
Prerequisite: CY 301. Accompanying laboratory course for AL 651.

AL 653—Vitamins. 4 credits
Prerequisite: Organic Chemistry. Historical development, properties, assays and physiological effects.

AL 654—Laboratory in Vitamins. 2 credits
Chemical determination and assay procedures. Accompanying laboratory course for AL 653.

AL 655—Mineral Nutrition and Metabolism. 4 credits
Physiological effort of macro- and micro-elements, mineral interrelationships.

AL 656—Ruminant Physiology and Metabolism. 3 credits
Prerequisite: AL 527. A review and correlation of the fundamental biochemical, physiological, and bacteriological research upon which the feeding of ruminants is based. Emphasis is placed on experimental methodology of rumen physiology and metabolism.

AL 657—Non-Ruminant Metabolism. 3 credits
Prerequisite: AL 527. Basic principles affecting absorption and assimilation of nutrients required for growth, reproduction and lactation of swine and small laboratory animals.

AL 659—Genetics of Animal Improvement. 4 credits
Prerequisite: AL 602. Continuation of AL 602. Application of statistical techniques and design in animal breeding research.

AL 660—Graduate Seminar in Animal Science. 2 credits

AL 664—Topics in Genetics. 2 to 4 credits
Identical with AY 664, BTY 696, PY 664, ZY 664. May be repeated with change of content up to a maximum of 12 credits.
AL 699—Master's Research. 0 to 9 credits. Maximum 24 credits
AL 799—Doctoral Research. 1 to 12 credits

# BACTERIOLOGY

## GRADUATE FACULTY 1966–67

Tyler, M. E., *Chairman;* Blaylock, B. A.; Herzberg, M.; Jefferies, M. B.; Schneider, N. J.; Silver, W. S.; Smith, K. L.; Smith, P. H.

Graduate study is offered leading to the Master of Science or Doctor of Philosophy degrees in bacteriology. Close collaboration with the Department of Microbiology, College of Medicine, in joint teaching of graduate courses, provides a broad basis of contact with significant developments in microbiology. Special arrangements with the Bureau of Laboratories, State Board of Health, extend the potential area of research to the public health laboratory. Specialization in dairy microbiology for the Ph.D. may be taken in this department in collaboration with the Department of Dairy Science.

*Prerequisites* for admission to graduate study, in addition to those of the Graduate School, are a broad educational base including mathematics, physics, and chemistry through organic and analytical; basic courses in botany and zoology; and preferably at least one course in bacteriology. An undergraduate major in a physical science, engineering, or general biology is usually acceptable. Receipt of an advanced degree requires detailed knowledge in biology, microbiology, and chemistry; undergraduate deficiencies may require additional study prior to completion of graduate work.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

BCY 505—Basic Immunology. 4 credits
BCY 506—Bacterial Pathogens. 5 credits
BCY 520—Physicochemical Microbiology. 5 credits
BCY 521—Physicochemical Microbiology. 5 credits

## GRADUATE COURSES

BCY 650—Public Health Microbiology. 1 to 6 credits
Identical with MED 650. Prerequisites: Consent of chairman of department and director of laboratories. Reference study and laboratory practice of diagnostic techniques in the Microbiological Diagnostic Laboratory of the Shands Teaching Hospital of the University of Florida Health Center or in residence at the Bureau of Laboratories, State Department of Health, Jacksonville, Florida. May be repeated with change of content up to a maximum of 18 credits.
BCY 651—Special Topics in Microbiology. 3 credits
Identical with MED 651. Prerequisite: 6 credits in graduate major courses. Organized study of contemporary research in a particular aspect of general microbiology. May be repeated with change of content up to a maximum of 6 credits.
BCY 652—Virology. 3 credits
Identical with MED 652. Selected topics on modern concepts of the nature of

viruses and mechanism of viral infection, chosen from the field of animal, bacterial and plant viruses.

BCY 653—Virology Laboratory. 3 credits
Identical with MED 653. Prerequisite or corequisite: BCY 652. Selected laboratory experiments concerned with the nature of viruses and mechanisms of viral replication, as well as other consequences of viral infections.

BCY 654—Research Planning. 3 credits
Identical with MED 654. Prerequisite: 20 credits in progressive study of microbiology. An outline of the processes involved in scientific research including initiating a problem, experimental techniques, analyses and evaluation of data, and reporting, illustrated by bacteriological examples.

BCY 655—Experimental Microbiology. 2 to 5 credits
Identical with MED 655. Prerequisites: 12 credits of microbiology, consent of instructor. Application of physical, chemical and biological techniques to experimental problems in microbiology. Individual laboratory study. May be repeated with change of content up to a maximum of 8 credits.

BCY 656—The Literature of Microbiology. 3 credits
Identical with MED 656. Prerequisites: 12 credits of microbiology, consent of instructor. Bibliographic method in searching the literature. Intensive study of the literature of specified areas of the discipline.

BCY 657—Microbial Metabolism. 5 credits
Identical with MED 657. Prerequisite: BCH 601, BCH 603. Intermediary metabolism of microorganisms emphasizing those metabolic pathways that are unique or characteristic primarily of microorganisms.

BCY 658—Microbial Physiology. 5 credits
Identical with MED 658. Prerequisites: Microbial Metabolism, BCY 657 or consent of instructor. Structural and functional elements of microorganisms and mechanics of their regulatory systems. Mechanisms of control of microbial DNA replication, cell division, ribosome and cell-wall formation, kinetic studies of normal and abnormal growth.

BCY 659—Principles of Immunology. 3 credits
Identical with MED 659. Prerequisite: BCY 505 or MED 551. Biological and biochemical aspects of host resistance and immunity, with emphasis on the chemical and physicochemical properties of the proteins of immune reactions.

BCY 660—Immunology Laboratory. 3 credits
Identical with MED 660. Prerequisite: Consent of staff. Corequisite: BCY 659.

BCY 661—Biology of Uncommon Microorganisms. 5 credits
Identical with MED 661. Prerequisites: BCY 312, consent of instructor. Natural distribution, metabolic activities, isolation and culture of selected groups of microorganisms.

BCY 662—Microbial Genetics. 5 credits
Identical with MED 662. Prerequisites: BCY 521, general genetics. Microbial genetics including mutation, selection, transformation, transduction, conjugation and episomal factors; molecular structure and function of genes.

BCY 663—Parasitic Diseases of the Tropics and Subtropics. 5 credits
Identical with MED 663 and VY 663. Animal parasitology covering mechanisms of parasitic infections, physiology of parasites, and immune responses of the host.

BCY 669—Seminar. 1 credit
Identical with MED 669. Attendance required of all graduate majors at one

student and one non-student presentation each week as scheduled. Jointly with Department of Microbiology. May be repeated with change of content.

BCY 699—Master's Research. 0 to 9 credits. Maximum 24 credits
BCY 799—Doctoral Research. 1 to 12 credits

# BOTANY

## GRADUATE FACULTY 1966–67

Shanor, L., *Chairman;* Aldrich, H. C.; Anthony, D. S.; Davis, J. H., Jr.; Ford, E. S.; Fritz, G. J.; Griffith, Mildred M.; Humphreys, T. E.; Kimbrough, J. W.; Mullins, J. T.; Popenoe, H. L.; Smith, Richard C.; Stanley, R. G.; Ward, D. B.

The Department of Botany offers graduate work leading to the degrees of Master of Science, Master of Agriculture, Master of Science in Teaching, and Doctor of Philosophy.

For admission to graduate standing a student should present credits equivalent to those required of undergraduate majors in the department. Undergraduate major requirements include: 36 credits in botany, a course with laboratory in genetics, mathematics through differential calculus, one year of college physics and chemistry through organic. Those admitted without full equivalents of an undergraduate major will be required to make up deficiencies by passing appropriate courses early in their graduate programs. A reading knowledge of a foreign language and credit for basic courses in zoology and bacteriology are desirable. The program of graduate study for each student will be determined by a supervisory committee.

For advisory purposes all graduate students will be given an examination covering the broad general field of botany by the department during or soon after their first quarter of residence. The results of this examination will be used by the supervisory committee in planning the student's program. Each student pursuing the Ph.D. degree will be required to pass a written departmental examination on designated major areas in botany prior to the qualifying examination.

There are in addition to the facilities of the department for graduate work, the following special resources that may be utilized in support of graduate student training and research: (1) The Florida Agricultural Experiment Station and its branch stations, (2) the specialized facilities for radiation biology in the Nuclear Sciences Building, (3) The Marine Sciences Center on the Gulf of Mexico for studies in estuarine and marine habitats, (4) the resources of the Welaka Conservation Reserve and (5) the Center for Tropical Agriculture which can support studies in tropical and subtropical areas.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

BTY 500—Plant Geography. 4 credits
BTY 501—Plant Ecology. 5 credits
BTY 515—Intermediate Plant Physiology. 5 credits
BTY 521—Introductory Mycology. 5 credits
BTY 522—Phycology. 3 credits

BTY 523—Mosses and Liverworts. 3 credits
BTY 524—Lower Vascular Plants. 3 credits
BTY 532—Plant Anatomy. 5 credits
BTY 542—Taxonomy of Seed Plants. 5 credits
BTY 551—Cytology. 5 credits

## GRADUATE COURSES

BTY 601—Vegetation of Florida. 4 credits
Prerequisite: BTY 501. All types of vegetation in Florida in relation to soils, climate, physiographic and geologic conditions.

BTY 602—Ecology of Aquatic Plants. 3 credits
Prerequisite: BTY 501. Desirable preprequisite: ZY 628. Aquatic plant communities of lakes, ponds, rivers and marshes.

BTY 604—Vegetation of the Tropics. 4 credits
Prerequisite: BTY 501. An ecological and geographical study of the important types of vegetation in the American and other tropical regions, with emphasis on their relation to man.

BTY 615—Plant Growth and Development. 3 credits
Prerequisite: BTY 515. A detailed study of how environmental factors influence plant growth and development.

BTY 616—Plant Nutrition. 2 credits
Prerequisite: BTY 515. Fundamental aspects of plant nutrition, including such topics as the essentiality of elements, absorption of ions, utilization and role of nutrients, redistribution of minerals in plants and water metabolism.

BTY 617—Plant Metabolism. 3 credits
Prerequisites: BTY 515, BCH 402, consent of instructor. The metabolism of carbohydrates, fats and nitrogen compounds in higher plants; cell structure as related to metabolism; metabolic control mechanisms.

BTY 618—Radiation and Plant Growth. 3 credits
Prerequisite: BTY 515. The effects of radiant energy on the physiology of plants. Topics covered include generation, control and measurement of radiant energy; photosynthesis; phototropism; photoperiodism; effect of the color of the light.

BTY 621—Advanced Mycology 1. 4 credits
Identical with PT 631. Prerequisites: BTY 521, consent of the instructor. First part of a three-course sequence designed for students whose major or minor is mycology, botany or plant pathology. Morphology and taxonomy of fungi and identification of specimens. Emphasizes basidiomycetes and fungi imperfecti. Field work is required.

BTY 622—Advanced Mycology 2. 4 credits
Identical with PT 632. Prerequisites: BTY 621, consent of the instructor. Emphasizes myxomycetes and phycomycetes. Continuation of BTY 621.

BTY 623—Advanced Mycology 3. 4 credits
Identical with PT 633. Prerequisites: BTY 622, consent of instructor. Emphasizes ascomycetes and lichens. Continuation of BTY 622.

BTY 631—Morphology of Seed Plants. 3 credits
Prerequisites: BTY 532, BTY 542. Anatomy and histology of the organs of representative modern and fossil seed plants, emphasizing form, vascular systems and reproduction structures from phyletic and descriptive viewpoints.

BTY 642—Advanced Taxonomy. 3 credits
Prerequisite: BTY 542. Problems in the classification of vascular plants. Pub-

lished taxonomic studies reviewed as a demonstration of the techniques and principles involved in classification; intensive individual work required in field and herbarium application of these procedures.

BTY 655—Plant Cytology. 5 credits

Prerequisite: BTY 551. Fundamental structures of plant cells, their functions, reproduction and relation to inheritance; recent research and techniques.

BTY 656—Cytochemistry. 3 credits

A symtematic survey of cellular organization, cell function and cytochemical technique.

BTY 690—Problems in Botany. 2 to 5 credits

Prerequisites: Approval of chairman of department and consent of instructor. Problems in one or more of the following fields of botany: cytology, ecology, morphology and anatomy, physiology, radiation biology and taxonomy. May be repeated with change of content up to a maximum of 9 credits.

BTY 692—Botany Seminar. 1 credit

Graduate majors expected to participate regularly. They will register for 1 credit during the last quarter of a degree program. Not available for graduate minor credit except by special permission of the chairman of the department.

BTY 695—Topics in Botany. 2 credits

Prerequisite: Consent of instructor. Available topics include plant biophysics, growth regulators, chromatography, water relations, ultrastructure cytology, plant morphogenesis and biosystematics.

BTY 696—Topics in Genetics. 2 to 4 credits

Identical with AL 664, AY 664, PY 664, ZY 664. See AY 664. May be repeated with change of content up to a maximum of 12 credits.

BTY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

BTY 799—Doctoral Research. 1 to 12 credits

# DAIRY SCIENCE

## GRADUATE FACULTY 1966–67

Browning, C. B., *Chairman;* Fouts, E. L.; Head, H. H.; Krienke, W. A.; Marshall, S. P.; Mull, L. E.; Smith, K. L.; Wilcox, C. J.; Wing, J. M.

The Department of Dairy Science offers work for the Master of Science in Agriculture and the Master of Agriculture degrees. Major courses may be chosen from the fields of dairy husbandry or dairy manufacturing. Areas of interest include animal breeding and genetics, nutrition, physiology, management, microbiology, milk chemistry, and the processing of milk and milk products.

Programs leading to the degree Doctor of Philosophy with emphasis on problems related to dairy science may be obtained through the departments of Animal Science or Bacteriology with staff members from Dairy Science directing the program.

A departmental prerequisite for admission to graduate study in dairy husbandry is a sound background in the biological sciences. Students interested in graduate study in dairy manufacturing should have had a strong undergraduate program in the physical and biological sciences.

COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

DY 501—Physiology of Lactation. 5 credits

GRADUATE COURSES

DY 601—Dairy Science Research Techniques. 3 credits
Methods employed in research in various specialized dairy fields: genetics, nutrition, physiology, microbiology, chemistry or dairy technology. Covers use of equipment, materials and methods, experimental designs and statistical analysis.

DY 602—Problems in Dairy Science. 1 to 5 credits
Selected research problems in dairy husbandry or dairy manufacturing. May be repeated with change of content up to a maximum of 12 credits.

DY 603—Graduate Seminar in Dairy Science. 1 credit

DY 610—Advanced Dairy Technology. 5 credits
Theories associated with chemical and physical changes of milk constituents during processing and/or storage of dairy products. Special tests and quality measurements essential in identifying and measuring degrees of these changes.

DY 611—Advanced Dairy Products Processing. 5 credits
Advanced methods of processing, and approaches to new product development through rearranged operations and adaptations of specialized types of equipment and their functions.

DY 612—Advanced Dairy Microbiology. 5 credits
Methods of microbiological control of dairy products, with emphasis on physiological chemistry of dairy microorganisms and metabolic pathways in dairy product fermentations.

DY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# ENTOMOLOGY

## GRADUATE FACULTY 1966–67

Eden, W. G., *Chairman;* Blanton, F. S.; Creighton, J. T.; Cromroy, H. L.; Gahan, J. B.; Gilbert, I. H.; Habeck, D. H.; Hetrick, L. A.; Hussey, R. F.; Kerr, S. H.; Kramer, S.; Kuitert, L. C.; LaBrecque, G. C.; Morgan, P. B.; Muma, M. H.; Murphey, M., Jr.; Nation, J. L.; Perry, V. G.; Rhoades, H. L.; Simanton, W. A.; Smart, G. C., Jr.; Smith, C. N.; Smith, W. W.; Smittle, B. J.; Turner, R. B.; Walker, T. J.; Westfall, M. J.; Wilkinson, R. C.; Winchester, J. A.; Wolfenbarger, D. O.

The Department of Entomology offers major work leading to the Master of Agriculture, Master of Science and Doctor of Philosophy degrees in entomology and nematology. The staff is qualified to direct graduate study in all of the principal areas of entomology and nematology; however, it is particularly strong in economic and taxonomic nematology and in economic, taxonomic, forest and medical entomology, structural pest control, apiculture and physiology, ecology and behavior. Minor work is offered to students taking major work in other departments.

*Prerequisites* to graduate training in entomology include a B.S. degree from a recognized institution and background in biology, chemistry, physics and mathematics.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EY 501—Plant Parasitic Nematodes. 5 credits
EY 515—Biological Control of Insects. 4 credits
EY 518—Tropical Entomology. 4 credits
EY 520—Immature Insects. 5 credits
EY 521—Acarology. 4 credits
EY 522—Tropical Nematology. 5 credits

## GRADUATE COURSES

EY 603—Problems in Entomology. 1 to 5 credits
A problem for study may be selected in any field of entomological or nematological specialization, including histology, morphology, physiology, taxonomy, embryology, biological control, ecology, toxicology, plant quarantine, commercial entomology, life history and habits, biology and medical and veterinary entomology. May be repeated with change of content up to a maximum of 9 credits.

EY 607—Insect Taxonomy. 5 credits
Prerequisites: EY 408, EY 460, EY 608. Advanced study of systems of classification, the basis of systematic entomology and rules of nomenclature. Practice in identification of immature and adult insects in the field and laboratory.

EY 608—Insect Morphology. 5 credits
Prerequisite: EY 408. The external and internal anatomy of representative species of the several orders of insects.

EY 611—Graduate Seminar. 1 credit
Current developments in entomology and nematology. May be repeated with change of content up to a maximum of 4 credits.

EY 612—Insect Physiology. 5 credits
Prerequisites: EY 608, BCH 402, BCH 404 or consent of instructor. A detailed physiological study of the various organs and tissues of insects.

EY 615—Insect Behavior. 5 credits
Prerequisite: EY 612 or consent of instructor. Principles of animal behavior as they apply to insects. Consideration of reproductive, feeding, defensive, migratory and social behavior of insects. Field and laboratory techniques.

EY 616—Insect Ecology. 5 credits
Prerequisite: EY 612 or consent of instructor. The interrelations of insects and their physical and biotic environment. Population dynamics and control of population size. Field and laboratory techniques.

EY 618—Insect Toxicology. 5 credits
Prerequisites: EY 405, CY 362, CY 363. Insecticides and acaricides: structure, toxic action, metabolism, hazards, residues in relation to health. Acquired resistance to pesticides. Research methods in toxicology.

EY 620—Medical Entomology. 5 credits
Prerequisite: EY 420. Arthropods (except mosquitoes) parasitic on man: collection, identification and bionomics of local species.

EY 621—Mosquitoes. 5 credits
Prerequisite: EY 420. Mosquitoes: Collection, identification, bionomics and relationship to the health of man.

EY 631—Morphology and Physiology of Nematodes. 5 credits
Prerequisite: EY 303. A detailed anatomical study of the organs of nematodes and their vital functions.

EY 632—Taxonomy of Nematodes. 5 credits
Prerequisite: EY 631. The taxonomy and identification of members of the Phylum Nematoda.
EY 699—Master's Research. 0 to 9 credits. Maximum 24 credits
EY 799—Doctoral Research. 1 to 12 credits

# FOOD SCIENCE

## GRADUATE FACULTY 1966–67

Dennison, R. A., *Chairman;* French, R. B.; Hall, C. B.; Johnson, J. H.; Knapp, F. W.; Kuhn, G. D.; Robbins, R. C.; Showalter, R. K.; Van Middelem, C. H.; Wenzel, F. W.; Wolford, R. W.

*Prerequisite* for admission to graduate study, in addition to the requirements of the Graduate School, is a good scientific background. Students with insufficient background in chemistry, physics, mathematics, or bacteriology will be required to take these prerequisite subjects without graduate credit.

## GRADUATE COURSES

FS 601—Thermal Processing of Foods. 3 credits
Prerequisites: MS 302, BCY 313 and 9 credits of undergraduate food science. Thermodynamics of foods and food constituents; thermal resistance of enzymes and microorganisms; derivation of processing requirements for pasteurization, stabilization and sterilization.
FS 602—Food Refrigeration and Freezing. 3 credits
Prerequisite: 9 credits of undergraduate food science. Chemical, physical and microbiological principles and technology of preserving food by refrigeration and freezing.
FS 603—Food Concentration and Dehydration. 3 credits
Prerequisite: 9 credits of undergraduate food science. Chemical, physical and microbiological principles and technology of concentration and dehydration of foods by atmospheric, pressure differential, vacuum, sublimation and dielectric systems.
FS 604—Food Irradiation. 3 credits
Prerequisites: FS 401, FS 402. Principles and applications of ionizing radiations for the preservation of foods.
FS 605—Industrial Food Fermentations. 3 credits
Prerequisites: BCY 312 or 313 and 9 credits of undergraduate food science. Microbiological, chemical and physical principles in controlled fermentations of foods and food constituents.
FS 611—Carbohydrates of Foods. 4 credits
Prerequisite: FS 402. Chemistry and technology of sugars, starch, pectin and other carbohydrates and their applications in food products.
FS 612—Proteins and Enzymes of Foods. 4 credits
Prerequisites: FS 402, BCH 402. Chemical and physical aspects of food proteins. Enzyme problems and utilization in food preservation.
FS 613—Lipids of Foods. 3 credits
Prerequisite: FS 402. Chemistry, technology and uses of edible fats and oils. Stability problems.
FS 614—Flavor Chemistry. 3 credits
Prerequisites: CY 362; FS 401 or FS 402. Physical, physiological and chemical

aspects of flavor perception. Flavor chemistry and control of flavor in representative foods.

FS 621—Food Product Development. 3 credits
Prerequisite: 9 graduate credits in food science. Theortical and technological considerations of food product development.

FS 631—Food Texture and Color. 3 credits
Physical and chemical properties of food texture, pigments and color; methods of measurement and influence of processing on texture and color.

FS 641—Advanced Human Nutrition. 3 credits
Prerequisite: BCH 402 or AL 527.

FS 642—Proteins and Amino Acids in Nutrition. 3 credits
Prerequisite: BCH 402. Nutritional aspects of proteins and amino acids with emphasis on requirements, evaluation and formulation of diets for various physiological functions.

FS 643—Nutritional Aspects of Carbohydrates and Lipids. 3 credits
Prerequisite: BCH 402. The role of carbohydrates and lipids in nutrition, with emphasis on energy metabolism.

FS 651—Topics in Food Science. 2 credits
Prerequisite: Consent of instructor. Selected topics in food science critically studied include color in foods, nutritional studies of processed foods, food additives, food lipids, food enzymology, flavor chemistry and sensory evaluations. May be repeated with change of content up to a maximum of 6 credits.

FS 661—Food Science Seminar. 1 credit
Preparation and presentation of reports on specialized aspects of research in food science.

FS 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# FRUIT CROPS

## GRADUATE FACULTY 1966–67

Krezdorn, A. H., *Chairman;* Biggs, R. H.; Campbell, C. W.; Ford, H. W.; Gerber, J. F.; Grierson, W.; Hendershott, C. H.; Lawrence, F. P.; Leonard, C. D.; Reitz, H. J.; Sharpe, R. H.; Sherman, W. B.; Sites, J. W.; Soule, J.; Stewart, I.; Ziegler, L. W.

The Department of Fruit Crops offers work leading to the degrees of Master of Agriculture, Master of Science in Agriculture and Doctor of Philosophy.

The interest of the student and the guidance and facilities available will determine the field for the thesis problem when required. Through cooperation of the Florida Agricultural Experiment Station and its branch stations, it is possible for thesis research for the Master of Science in Agriculture and Doctor of Philosophy degrees in certain fields to be conducted at these stations.

*Prerequisites* for admission to graduate study in addition to those of the Graduate School are a sound background in horticulture, botany, mathematics, chemistry, entomology, soils and plant pathology. The student will be held responsible for such basic undergraduate courses as are deemed necessary for the pursuit of his thesis work.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

FC 523—MAJOR TROPICAL FRUITS. 4 credits

FC 524—MINOR TROPICAL AND SUBTROPICAL FRUITS. 4 credits

## GRADUATE COURSES

FC 601—FRUIT CROPS SEMINAR. 1 credit

Required of all graduate students each quarter it is offered. May be repeated with change of content up to a maximum of 2 credits.

FC 602—PHYSIOLOGY OF FRUIT CROPS. 5 credits

Prerequisite: BTY 310. Physiology of the growth and development of fruit crops, with emphasis on fruit trees.

FC 603—MORPHOLOGY OF FRUIT CROPS. 3 credits

Prerequisite: BTY 532. The morphological features of both tropical and temperate zone fruit crops, their modification by environment and their relation to cultural practices and production problems.

FC 604—TAXONOMY OF FRUIT CROPS. 3 credits

Prerequisite: BTY 380. The nomenclature, classification and identification of tropical and temperate zone fruit crops, with emphasis on the scientific basis and utility of the various systems.

FC 605—BREEDING OF FRUIT CROPS. 4 credits

Prerequisite: AY 362. Principles of fruit crop breeding and varietal improvement, including patterns of evolution, mechanisms of heredity and genetic parameters. Specific breeding problems in tropical and deciduous fruit crops.

FC 606—ROOTSTOCK-SCION RELATIONSHIPS. 4 credits

Rootstock-scion relationships in their influence on disease susceptibilities, soil and climatic adaptions, bud-union incompatibilities and fruit production.

FC 610—CITRICULTURE. 5 credits

An advanced course in citrus growing, emphasizing the problems offered by varying sites, soils, climates, stocks and varieties.

FC 611—CITRUS PRODUCTION MANAGEMENT. 5 credits

Methods of tabulating and evaluating the functions of citrus trees in relation to fruit production. Emphasis on actual field recognition of the various factors in production and the means of properly organizing field management for the problems involved.

FC 615—AGRICULTURAL METEOROLOGY. 4 credits

Prerequisite: Consent of instructor. The climate and meteorology of the biosphere with special reference to fruit crops. Covers heat budget of the plant-soil surface, turbulent transport, evapotranspiration, frost protection and an introduction to phenology and statistical agricultural climatology.

FC 620—RESEARCH METHODS IN FRUIT CROPS. 4 credits

Research methods, including literature survey, collecting, analyzing, interpreting and presenting data; methods of measurement of plot responses; use of instruments useful in plant analysis.

FC 621—ENVIRONMENTAL MEASUREMENTS. 4 credits

Prerequisites: MS 301, PS 202. Methods and techniques employed in the characterization of the biosphere, with special emphasis for the agricultural plant scientist. Includes sensor selection, measuring and recording equipment for light, wind, temperature, humidity and heat flow.

FC 640—TOPICS IN FRUIT CROPS. 2 to 4 credits

An organized study of contemporary research in fruit crops. May be repeated with change of content up to a maximum of 8 credits.

FC 670—Non-Thesis Research Methods in Fruit Crops. 1 to 9 credits
Maximum 9 credits
FC 699—Master's Research. 0 to 9 credits. Maximum 24 credits
FC 799—Doctoral Research. 1 to 12 credits

# ORNAMENTAL HORTICULTURE

## GRADUATE FACULTY 1966–67

McElwee, E. W., *Chairman;* Dickey, R. D.; Horn, G. C.; Joiner, J. N.; Sheehan, T. J.

Graduate majors in ornamental horticulture should have 24 undergraduate credits in horticulture or ornamental horticulture. The student is advised to have completed 30 credits in basic courses in botany, chemistry, soils, entomology, plant pathology and related subjects.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

OH 511—Orchidology. 4 credits

## GRADUATE COURSES

OH 603—Graduate Seminar. 1 credit
May be repeated with change of content up to a maximum of 2 credits.
OH 612—Nutrition of Oranamental Plants. 4 credits
Prerequisites: BTY 310, OH 441. Methods used for determining needs and control of the nutrition of horticultural plants grown in containers, beds, hydroponics and in the field, and the resulting effect on plant growth and quality.
OH 620—Advanced Nursery Management. 4 credits
Prerequisites: BTY 310, PLS 301, OH 420. A study of literature and the application of research to the problems of commercial production of woody ornamental plants.
OH 630—Research Methods in Ornamental Horticulture. 4 credits
Prerequisite: Consent of instructor. Research methods, procedures, and literature; outlining problems; assembling and analyzing data; presenting results.
OH 641—Advanced Floriculture. 4 credits
Prerequisite: OH 442 or OH 443. Physiological and biochemical factors affecting growth and yield of floricultural crops; use and effects of growth-regulating compounds and herbicides and techniques of breeding these crops; post-harvest physiology, storage and marketing problems.
OH 662—Research Methods and Advanced Turf Technology. 4 credits
Prerequisite: OH 463. Principles and problems of turfgrass improvement and management, including propagation, nutrition, physiology, soil management and experimental methods applied to turf research.
OH 670—Non-Thesis Research in Ornamental Horticulture.
1 to 9 credits
OH 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# PLANT PATHOLOGY

## GRADUATE FACULTY 1966–67

DECKER, P., *Chairman;* COOK, A. A.; FREEMAN, T. E.; KIMBROUGH, J. W.; LUKE, H. H.; MILLER, C. R.; MILLER, H. N.; PURCIFULL, D. E.; ROBERTS, D. A.; STALL, R. E.; ZETTLER, F. W.

All incoming graduate students should report immediately to the chairman of the department. Students must consult with instructors before enrolling in courses.

Students beginning work toward an advanced degree must have a baccalaureate degree and should have completed several courses in basic physical and biological sciences. Reading knowledge of one modern foreign language is required for the Master of Science degree. Language requirements for the Ph.D. degree are described elsewhere in this *Catalog*.

An oral preliminary examination is given by the department to each student soon after the completion of one term of registration as a graduate student. Course requirements for advanced degrees are determined by the Supervisory Committee and are predicated upon the background and objectives of the student.

Additional courses in nematology are described and presented by the Department of Entomology.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

PT 500—PROBLEMS IN PLANT PATHOLOGY. 1 to 3 credits
PT 501—PLANT PARASITIC NEMATODES. 5 credits
PT 522—TROPICAL NEMATOLOGY. 5 credits
PT 531—INTRODUCTORY MYCOLOGY. 5 credits

## GRADUATE COURSES

PT 600—COLLOQUIUM IN PRINCIPLES OF PLANT PATHOLOGY. 1 credit
Prerequisite: Consent of instructor. Discussion of the basic laws of plant pathology as illustrated by classical research papers.

PT 601—PLANT PATHOGENESIS. 5 credits
Prerequisite: Consent of instructor. A study of the initiation and development of disease in plants.

PT 611—PLANT VIROLOGY LECTURE. 3 credits
Prerequisite: Consent of instructor. Principles of plant virology; symptomatology, transmission, insect vector relationships, properties of viruses, purification, electron microscopy, morphology, serology and control of viral diseases.

PT 612—PLANT VIROLOGY LABORATORY. 2 credits
Prerequisites: PT 611, consent of instructor. Methods of research in plant virology.

PT 621—BACTERIAL PLANT PATHOGENS. 5 credits
Prerequisites: BCY 310, BCY 311, consent of instructor. The study of plant pathogenic bacteria, with emphasis on bacteriological problems that are unique in plant pathology.

PT 631—ADVANCED MYCOLOGY 1. 4 credits
Identical with BTY 621. Prerequisites: PT 531, consent of instructor. First of a three-course sequence designed for students whose major or minor is mycology,

botany or plant pathology. Morphology and taxonomy of fungi and identification of specimens. Emphasizes basidiomycetes and fungi imperfecti. Field work is required.

PT 632—Advanced Mycology 2. 4 credits

Identical with BTY 622. Prerequisites: PT 631, consent of instructor. Emphasizes myxomycetes and phycomycetes. Continuation of PT 631.

PT 633—Advanced Mycology 3. 4 credits

Identical with BTY 623. Prerequisites: PT 632, consent of instructor. Ascomycetes and lichens. Continuation of PT 632.

PT 650—Seminar in Plant Pathology. 1 credit

Discussion of the literature, techniques and research pertaining to plant pathology.

PT 699—Master's Research. 0 to 9 credits. Maximum 24 credits

PT 799—Doctoral Research. 1 to 12 credits

# POULTRY SCIENCE

## GRADUATE FACULTY 1966–67

Harms, R. H., *Chairman;* Fry, J. L.; Wilson, H. R.

The Department of Poultry Science offers major work for the degrees of Master of Agriculture and Master of Science in Agriculture. Areas of specialization are nutrition, genetics, physiology, poultry and egg processing, marketing and management. Minor work is offered students taking major work in other departments.

A departmental prerequisite for admission to graduate study is a sound background in the biological sciences.

Students wishing to take either major or minor work in poultry science should consult departmental advisers.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

PY 514—Poultry Nutrition. 3 credits

## GRADUATE COURSES

PY 607—Topics in Poultry Production. 2 or 3 credits

Prerequisites: ADP 311, ADP 312, consent of instructor. Offered primarily to Agricultural Extension workers and vocational Agricultural teachers. Each time this course is offered it will be announced in *Schedule of Courses,* with emphasis on the specified topic: production principles, principles of handling and marketing or nutrition. May be repeated with change of content up to a maximum of 9 credits.

PY 612—Avian Physiology. 3 to 5 credits

Prerequisite: VY 301. Environmental physiology, ovulation cycle and egg formation, reproductive efficiency, experimental physiological techniques. May be repeated with change of content up to a maximum of 5 credits.

PY 614—Advanced Poultry Nutrition. 2 to 5 credits

Prerequisites: ADP 312, PY 514. Metabolism of essential nutrients, and role of enzymes and hormones in poultry nutrition. May be repeated with change of content up to a maximum of 5 credits.

PY 617—Problems in Egg and Poultry Meat Technology. 2 to 5 credits
Prerequisite: PY 317. The physical, chemical and bacteriological aspects in the preparation, storage, and marketing of eggs and poultry meat. May be repeated with change of content up to a maximum of 5 credits.

PY 631—Advanced Poultry Management. 4 credits
Detailed study of costs and returns in producing eggs, poultry meat and baby chicks; poultry finances; organization of business.

PY 660—Graduate Seminar in Poultry Science. 1 credit
Review and discussion of current literature and developments in poultry science. May be repeated with change of content up to a maximum of 3 credits.

PY 664—Topics in Genetics. 2 to 4 credits
Identical with AL 664, AY 664, BTY 696, ZY 664. See AY 664. May be repeated with change of content up to a maximum of 12 credits.

PY 670—Advanced Problems in Poultry Production. 1 to 4 credits
Individual problems in fields of nutrition, genetics, physiology, poultry and egg marketing and processing and management. May be repeated with change of content up to a maximum of 12 credits.

PY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# SOILS

## GRADUATE FACULTY 1966–67

Eno, C. F., *Chairman;* Blue, W. G.; Breland, H. L.; Caldwell, R. E.; Carlisle, V. W.; Edson, S. N.; Fiskell, J. G. A.; Gammon, N., Jr.; Hammond, L. C.; Popenoe, H. L.; Pritchett, W. L.; Robertson, W. K.; Rothwell, D. F.; Smith, F. B.; Spinks, D. O.; Thornton, G. D.; Volk, G. M.

The fields of graduate work offered in soils are soil fertility, soil chemistry, soil genesis and morphology, soil microbiology and soil physics. The interests of the student and the facilities available determine the field for the thesis problem. The student will present his dissertation in his major field. However, all Doctor of Philosophy candidates will be expected to qualify in the four major fields named above.

*Prerequisites:* A student who expects to do graduate work in the Department of Soils should present the bachelor's degree, from a recognized college of agriculture, with a major in soils, or the equivalent in other sciences. His background should include at least one course in each of the following: general soils, soil morphology and classification, soil fertility, general bacteriology, general botany, plant physiology, general field crops, general inorganic chemistry, qualitative analysis and organic or biochemistry. This would ordinarily mean at least 25 credits, or equivalent, of undergraduate work in the department. Those not meeting the above requirements will be required to make up any deficiency early in their graduate work. The student will be held responsible for such basic undergraduate courses as are deemed necessary for the pursuit of his special project.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

SLS 525—Tropical Soils. 3 credits

### GRADUATE COURSES

SLS 600—Topics in Soils. 3 credits
Prerequisite: SLS 330. Variable content; offered by arrangement to qualified students at continuing education centers. May be repeated with change of content up to a maximum of 6 credits.

SLS 621—Soil Chemistry. 5 credits
Prerequisites: SLS 421, CY 331, CY 318. Clay minerals and their ionic environment. Factors affecting availability and losses of plant nutrient elements.

SLS 622—Soil Microbiology. 4 credits
Prerequisite: SLS 422. Microorganisms of mineral and organic soils; their ecological relationships and metabolic processes.

SLS 623—Soil Genesis and Classification. 3 credits
Prerequisite: SLS 423. Developmental factors, morphological characteristics, systems of classification and distribution of soils of the world.

SLS 624—Soil Physics. 4 credits
Prerequisites: SLS 424, PS 201, PS 202. The mechanical, thermal, electrical and optical properties of soils; water-clay mineral interactions. Soil structure and the retention and transmission of water and gases.

SLS 626—Soil Fertility. 4 credits
Prerequisite: SLS 421. Plant response to variations in soil environment.

SLS 627—Laboratory Methods of Soil Chemical Analyses. 4 credits
Prerequisites: SLS 421, CY 331. Instrumental and analytical procedures.

SLS 651—Seminar. 0 to 1 credit
Presentation of literature and methods of proposed thesis research, and selected topics. May be repeated with change of content up to a maximum of 4 credits.

SLS 670—Non-Thesis Research. 0 to 6 credits
Prerequisite: 15 credits of soils. Organized study and research in a particular aspect of soils. May be repeated with change of content up to a maximum of 9 credits.

SLS 699—Master's Research. 0 to 9 credits. Maximum 24 credits

SLS 799—Doctoral Research. 1 to 12 credits

## STATISTICS

### GRADUATE FACULTY 1966–67

Mendenhall, W. III, *Chairman;* Ash, W. O.; Barnett, F. C.; Chanda, K. C.; Gupta, R. P.; Martin, F. G.; Pop-Stojanovic, Z. R.; Rao, P. V.; Saw, J. G.; Thornby, J. I.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

STA 520—Statistical Methods in Research. 3 credits

STA 521—Experimental Design in Research 1. 3 credits

STA 522—Experimental Design in Research 2. 3 credits

STA 525—Design and Analysis of Experiments 1. 3 credits

STA 526—Design and Analysis of Experiments 2. 3 credits

STA 527—Design and Analysis of Experiments 3. 3 credits

STA 540—Introduction to Theoretical Statistics 1. 3 credits

STA 541—Introduction to Theoretical Statistics 2. 3 credits

STA 542—Introduction to Theoretical Statistics 3. 3 credits

## GRADUATE COURSES

STA 601—Advanced Methods of Statistics. 3 credits
Prerequisite: STA 522. A continuation of STA 522, leading to the more complex experimental designs. Incomplete blocks, confounding, fractional replication and response surfaces.

STA 619—Theory of Least Squares. 3 credits
Prerequisite: STA 541. Application of the Markov theory of least squares to the problems of estimation and tests of hypotheses; distribution theory under normal assumptions.

STA 620—Theory of Completely Random and Mixed Models. 3 credits
Prerequisite: STA 619. General theory and application of completely random and mixed models with special reference to problems in estimation and tests of hypotheses.

STA 621—Design of Experiments. 4 credits
Prerequisite: STA 527. A continuation of STA 527. Applications of confounding and fractional replication, design and analysis of balanced and partially balanced incomplete block designs, further considerations of the mixed model.

STA 622—Sampling Theory and Application. 4 credits
Prerequisite: STA 541. Theory of basic sampling procedures in economic and social surveys. Multistage sampling, cost functions, double sampling, sampling of time series.

STA 623—The Analysis of Multivariate Data. 4 credits
Prerequisite: STA 541. Generalizations of techniques in the analysis of univariate data to the analysis of correlated data. Special problems in the analysis of multivariate data; elements of factor analysis.

STA 628—Problems in Statistics. 1 to 5 credits
Prerequisite: Permission of department. Special problems in the areas of research methods, sampling methods, and experimental design. May be repeated with change of content up to a maximum of 9 credits.

STA 640—Theory of Statistics 1. 3 credits
Prerequisites: STA 542, advanced calculus. Measure theoretic approach to probability and statistics: random variables, probability functions and distribution functions. Expectation and characteristic functions.

STA 641—Theory of Statistics 2. 3 credits
Prerequisite: STA 640. Notions of convergence of sequences of independent random variables: continuity theorem, central limit theorem and law of large numbers. Exact and asymptotic theories of sampling distributions.

STA 642—Theory of Statistics 3. 3 credits
Prerequisite: STA 641. Theory of estimation and testing statistical hypotheses.

STA 650—Nonparametric Statistics 1. 3 credits
Prerequisite: STA 542. Distribution theory for order statistics. Estimators and tests for percentiles. Distribution of range, studentized range and related problems. Tests for outliers. Substitute t and F tests. Applications of order statistics in life-testing problems. Theory of linear estimation using order statistics.

STA 651—Nonparametric Statistics 2. 3 credits
Prerequisite: STA 650. A survey of the theory and methodology of distribution-free statistics not covered in STA 650.

STA 652—Sequential Analysis. 3 credits
Prerequisite: STA 542. Sequential likelihood ratio tests of two competing simple hypotheses. Operating characteristics, average sample number and optimal properties.

STA 660—Stochastic Processes 1. 3 credits
Prerequisite: STA 540. Basic concepts and techniques of the theory of stochastic processes. Normal processes, covariance processes, Poisson processes and their applications.

STA 661—Stochastic Processes 2. 3 credits
Prerequisite: STA 660. Continuation of STA 660. Applications.

STA 670—Multivariate Analysis 1. 3 credits
Prerequisite: STA 619. Multivariate tests of hypotheses. Construction of multivariate confidence regions, multivariate analysis of variance, discriminant analysis and tests of independence.

STA 671—Multivariate Analysis 2. 3 credits
Prerequisite: STA 670. Continuation of STA 670.

STA 680—Time Series 1. 3 credits
Prerequisites: STA 642, MS 643. A modern account of the statistical theory of stationary time series; covers the more important parts of spectral and prediction theory.

STA 681—Time Series 2. 3 credits
Prerequisite: STA 680. Completes the development begun in STA 680; includes a presentation of some problems discussed in journal articles.

STA 683—Advanced Probability Theory 1. 3 credits
Prerequisite: MS 643. An advanced treatment of probability at the level of Loeve's "Probability Theory." Covers general concepts of probability, independence and dependence.

STA 684—Advanced Probability Theory 2. 3 credits
Prerequisite: STA 683. Continuation of STA 683.

STA 686—Advanced Topics in Inference. 3 credits
Prerequisite: STA 642. An advanced topics course utilizing recent published research in the area of inference.

STA 691—Seminar. 1 credit
Prerequisite: Permission of department. Special topics of an advanced nature suitable for seminar treatment which are not given in regularly listed courses. May be repeated.

STA 699—Master's Research. 0 to 9 credits. Maximum 24 credits

## VEGETABLE CROPS

### GRADUATE FACULTY 1966–67

Jamison, F. S., *Chairman;* Gull, D. D.; Halsey, L. H.; Locascio, S. J.; Lorz, A. P.; Nettles, V. F.; Thompson, B. D.

*Prerequisites:* 30 credits of satisfactory work in horticultural science of which 18 must have been in, or closely allied with, vegetable crops. Additionally, the student should have satisfactorily completed basic science courses including botany, entomology, plant pathology and soils. If deficiencies exist, students must satisfy these requirements early in the graduate program.

The following courses in related areas will be acceptable for graduate credit as part of the candidate's major. These are: OH 612—Nutrition of Ornamental Plants; FC 615—Advanced Meterology; FC 616—Advanced Physiology of Fruit Crops; BTY 617—Plant Metabolism; AY 662—Advanced Genetics; AY 660—Cytogenetics.

### COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

VC 506—Handling Techniques and Practices in Marketing. 4 credits

### GRADUATE COURSES

VC 603—Vegetable Crops Seminar. 1 credit. Maximum 2 credits

VC 607—Topics in Vegetable Production Principles. 3 or 4 credits

Prerequisite: Consent of instructor. Offered primarily to Agricultural Extension and Vocational Agricultural teachers. Each time it is offered this course will be announced with one of the following topics specified: production principles, principles and practices in handling and marketing, nutrition of vegetables, role of agricultural chemicals. May be repeated with change of content up to a maximum of 10 credits.

VC 615—Advanced Olericulture. 5 credits

Prerequisite: BTY 310. A critical survey of scientific knowledge related to the production of vegetable crops.

VC 621—Techniques and Methods of Vegetable Breeding. 3 credits

Prerequisite: AY 362. Desirable prerequisites: PLS 452, BTY 551. Study of techniques in the breeding of vegetables for horticultural qualities and for resistance to diseases and animal pests, and of methods of testing new vegetable introduction.

VC 670—Non-Thesis Research in Vegetable Crops. 2 to 5 credits

Library, laboratory, and field studies in production, breeding, and handling of vegetable crops. May be repeated with change of content up to a maximum of 10 credits.

VC 699—Master's Research. 0 to 9 credits. Maximum 24 credits

VC 799—Doctoral Research. 1 to 12 credits

## VETERINARY SCIENCE

### GRADUATE FACULTY 1966–67

Edds, G. T., *Chairman;* Bradley, R. E.; Himes, J. A.; Kirkham, W. W.; Leland, S. E., Jr.; Neal, F. C.; Sanders, D. A.; Simpson, C. F.; Swanson, L. E.; White, F. H.

Excellent opportunities are available for properly qualified students to obtain research training and experience in animal and poultry diseases. The candidate should have a good background in zoology, genetics, chemistry, biochemistry, physics, bacteriology, anatomy and physiology. Deficiencies in the prerequisites must be satisfied as soon as possible.

At least 27 credits of the course work to be selected from the major, including veterinary research techniques, veterinary parasitology, pathology, hematology, microbiology, pharmacology and laboratory animal diseases; minor related subject, in consultation with the major adviser. Thesis and seminar credits are to be incorporated to a minimum of 45 credits.

The students may receive financial aid through assistantships, fellowships and research associateships.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

VY 506—Laboratory Animal Medicine. 5 credits

VY 516—Animal Parasitology. 5 credits

VY 522—Veterinary Physiology 1. 5 credits

VY 523—Veterinary Physiology 2. 5 credits
VY 562—Veterinary Parasitology 1. 5 credits
VY 563—Veterinary Parasitology 2. 5 credits

### GRADUATE COURSES

VY 602—Veterinary Pathology 1. 5 credits
Prerequisites: Degree in one of the medical sciences; suitable background in histology and approval of major professor. Selected topics in pathologic conditions affecting animals, with emphasis on cellular changes.

VY 603—Veterinary Pathology 2. 5 credits
Prerequisite: VY 602. Continuation of VY 602.

VY 622—Veterinary Hematology 1. 5 credits
Prerequisites: Suitable background in biology, physical chemistry, biological chemistry, histology, physiology and immunology. Selected topics on hematologic problems of domestic and laboratory animals, including poultry.

VY 623—Veterinary Hematology 2. 5 credits
Prerequisite: VY 622. Continuation of VY 622.

VY 624—Helminthology. 5 credits
Identical with ZY 624. Prerequisite: ZY 516.

VY 625—Protozoology. 5 credits
Identical with ZY 625.

VY 632—Veterinary Pharmacology 1. 5 credits
Prerequisites: Suitable background in the medical sciences; satisfactory work in physiology, biochemistry and immunology. Selected problems in prevention, treatment and control of animal diseases.

VY 633—Veterinary Pharmacology 2. 5 credits
Prerequisite: VY 632. Continuation of VY 632.

VY 642—Veterinary Microbiology 1. 6 credits
Prerequisite: Suitable background in the medical sciences. Course designed for special emphasis in the bacteriology and/or virology of those diseases limited to animals and the zoonoses.

VY 643—Veterinary Microbiology 2. 6 credits
Prerequisite: VY 642. Continuation of VY 642.

VY 663—Parasitic Diseases in the Tropics and Subtropics. 5 credits
Identical with MED 663 and BCY 663.

VY 682—Veterinary Research Techniques 1. 5 credits
The principles of biophysical science and their application to veterinary medical science.

VY 683—Problems in Veterinary Science 2. 1 to 5 credits
Prerequisite: VY 682. Continuation of VY 682. May be repeated with change of content up to a maximum of 5 credits.

VY 690—Seminar in Veterinary Science. 1 credit
May be repeated with change of content up to a maximum of 6 credits.

VY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

## SCHOOL OF FORESTRY

### GRADUATE FACULTY 1966–67

Gray, J. L., *Director;* Beckwith, S. L.; Frazer, P. W.; Goddard, R. E.; Huffman, J. B.; Kaufman, C. M.; Miller, J. W., Jr.; Smith, W. H.; Stanley, R. G.; Sullivan, E. T.; Swinford, K. R.

The School offers work leading to the degree of Master of Science in Forestry in the following fields: forestry, wildlife management, and forest products technology.

The Doctor of Philosophy degree may be earned in forest genetics, forest tree physiology, forest soils, and forest entomology through the Departments of Agronomy, Botany, Soils and Entomology respectively.

*Prerequisites:* Adequate preparation in biology, English, chemistry and mathematics, which may be obtained by completing at least one year's work in each field.

Students with a background other than forestry may be required to take undergraduate forestry courses pertinent to their field of interest early in their graduate program. Such courses will be considered as foundation work and will not carry graduate credit.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

FY 500—Introduction to Forestry Research. 3 to 6 credits
Maximum 6 credits

FY 528—Advanced Forest Mensuration. 5 credits

FY 536—Waterfowl Ecology. 5 credits

## GRADUATE COURSES

FY 602—Research Problems in Silviculture. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 603—Research Problems in Wood Utilization. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 605—Research Methods in Wildlife Management. 4 credits
Field and laboratory procedures used in wildlife research.

FY 606—Research Problems in Wildlife Management. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 607—Research Problems in Forest Economics. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 608—Research Problems in Forest Management. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 609—Research Problems in Forest Recreation. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 610—Research Problems in Forest Physiology. 3 to 9 credits
May be repeated with change of content up to a maximum of 9 credits.

FY 611—Graduate Seminar. 1 credit
Research reports and discussions of current literature. Fall quarter: recreation and wildlife. Winter: silviculture, pathology, physiology, and genetics. Spring: products technology, engineering and economics. Required of all graduate students in forestry. May be repeated with change of content up to a maximum of 3 credits.

FY 612—Topics in Forestry. 1 to 5 credits
Prerequisite: Consent of instructor. Includes physiology and ecology of managed forests, genotype-environmental interactions, biological and chemical control of forest pests, mechanization of forest harvesting, wood utilization, multiple-use planning for wood production, wildlife and forest recreation. May be repeated with change of content up to a maximum of 9 credits.

FY 615—Forest and Range Wildlife Ecology 1. 4 credits
Prerequisites: BTY 501, FY 434, STA 320, ZY 505. Evaluation of the major

ecosystems in the U. S. for forest and range animals by analyzing plant and animal components and relating them to reproductive patterns and factors controlling populations of wild animals.

FY 616—Forest and Range Wildlife Ecology 2. 4 credits
Continuation of FY 615.

FY 620—Advanced Physiology of Forest Trees. 3 credits
Prerequisite: BTY 505. Factors influencing forest tree and stand energy balance, flowering, seed production, germination, water relations and growth; applications to forestry problems.

FY 621—Biochemistry of Trees. 3 credits
Prerequisite: BTY 402 or BTY 505. The metabolic processes and constituents associated with tree growth, reproduction, formation of wood, terpene and other natural products. Emphasizes the formation of important forest tree chemicals.

FY 626—Forest Genetics 1. 4 credits
Prerequisite: An acceptable background in genetics. Application of principles of genetics in the silvicultural handling of forest stands; selection, hybridization and tree breeding techniques.

FY 627—Forest Genetics 2. 4 credits
Continuation of FY 626.

FY 631—Advanced Wood Preservation. 4 credits
Prerequisites: FY 414, PT 300. Relationships between wood and wood-deteriorating agencies; evaluation and analysis of preservatives; factors involved in treating wood; treatment and service evaluation.

FY 652—Timber Physics. 3 credits
Prerequisites: FY 408, PS 201, PS 202. The physical nature and properties of wood in relation to moisture, heat, sound, electricity and mechanical forces.

FY 653—Wood Chemistry. 3 credits
Prerequisites: FY 408, CY 362, CY 363. The chemical nature and properties of wood and its constituents in relation to industrial processing.

FY 680—Advanced Forest Economics. 4 credits
Prerequisites: FY 420. Analyses of the economics and economic problems of forestry and forest industries. Major emphasis on the forest economy of the United States.

FY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# COLLEGE OF ARCHITECTURE AND FINE ARTS

ARCHITECTURE

ART

BUILDING CONSTRUCTION

# ARCHITECTURE

## GRADUATE FACULTY 1966–67

LENDRUM, J. T., *Chairman;* ARNETT, W. T.; GRAND, J. L. R.; LARRICK, T.

The Department of Architecture offers graduate work leading to the degree of Master of Arts in Architecture. Graduation from an accredited school of architecture is prerequisite to admission. Applicants for admission must submit a portfolio.

Specialization may be in architectural design, structural design, building construction, or architectural research. Minors may be in any of these or in architectural history or in thermal and atmospheric control.

Holders of the five-year undergraduate degree in architecture may normally complete the requirements for the master's degree in one academic year.

All graduate courses may be repeated for credit with change of content. Some of the courses listed are offered regularly, while others are offered only as needed. For the listing of graduate courses for a given quarter, consult the *Schedule of Courses* for that quarter.

The Department reserves the right to retain student work for the purposes of record, exhibition, or instruction.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

AE 561—ARCHITECTURAL ACOUSTICS. 4 credits
AE 571—PROBLEMS IN ARCHITECTURAL HISTORY. 4 credits
AE 572—ARCHITECTURE SINCE 1890. 4 credits

## GRADUATE COURSES

AE 621—ARCHITECTURAL RESEARCH 1. 5 to 10 credits
Detailed investigation of a selected problem for the purpose of providing insight and understanding in some field of fundamental importance in architecture. May be repeated with change of content up to a maximum of 10 credits.

AE 622—ARCHITECTURAL RESEARCH 2. 5 to 10 credits
Continuation of AE 621. May be repeated with change of content up to a maximum of 10 credits.

AE 631—ARCHITECTURAL DESIGN 1. 5 to 10 credits
Research on a specific phase of architectural design, selected by the student with approval of faculty. May be repeated with change of content up to a maximum of 10 credits.

AE 632—ARCHITECTURAL DESIGN 2. 5 to 10 credits
Continuation of AE 631. May be repeated with change of content up to a maximum of 10 credits.

AE 651—STRUCTURAL DESIGN OF BUILDINGS 1. 5 to 10 credits
Advanced study of a problem in the structural design of buildings, selected by the student with the approval of the faculty. May be repeated with change of content up to a maximum of 10 credits.

AE 652—STRUCTURAL DESIGN OF BUILDINGS 2. 5 to 10 credits
Continuation of AE 651. May be repeated with change of content up to a maximum of 10 credits.

AE 661—Architectural Design for Thermal and Atmospheric Control. 5 to 10 credits
Prerequisite: AE 461. A study of the relationship between the building envelope and the equipment required to maintain thermal and atmospheric comfort. May be repeated with change of content up to a maximum of 10 credits.
AE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# ART

## GRADUATE FACULTY 1966–67

Grissom, E. E., *Chairman;* Holbrook, H. H.; Kerslake, K. A.; McIntosh, P. R.; Naylor, J. G.; Purser, S. R.; Uelsmann, J. N.; Ward, P. A.; Williams, H. D.

*Master of Fine Arts Degree:* The Department of Art offers graduate work leading to the degree of Master of Fine Arts. An undergraduate major in art with adequate preparation in studio courses in fine arts and in the history and theory of art is prerequisite to admission. Applicants for admission must submit a portfolio. Graduate work is divided between studio courses in ceramics, creative photography, drawing, painting, printmaking, and/or sculpture, and advanced study in the history of art. Two years of residence are normally required for completion of the requirements for this degree.

ART 500 is required of all graduate majors. All graduate courses may be repeated for credit with change of content. Some of the courses listed are offered regularly, while others are offered only as needed. For the listing of graduate courses for a given quarter, consult the *Schedule of Courses* for that quarter.

*Graduate minors in the history of art:* The graduate seminars are open to students minoring in the history of art, provided that suitable prerequisites have been completed. Courses in history, philosophy, or literature may often be substituted for prerequisites in art.

The Department reserves the right to retain student work for the purposes of record, exhibition, or instruction.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ART 500—Methods of Research and Bibliography. 3 credits
ART 551—Individual Work. 3 or 6 credits

## GRADUATE COURSES

ART 611—Seminar: Problems in Renaissance and Baroque Art. 3 credits
Prerequisites: ART 309, one undergraduate course in Renaissance or Baroque art.
ART 621—Seminar: Problems in 19th and 20th Century Art. 3 credits
Prerequisites: ART 309, one undergraduate course in 19th or 20th century art.
ART 622—Seminar: Problems in Contemporary Art. 3 credits
Prerequisites: ART 309, one undergraduate course in 19th or 20th century art.
ART 650—Advanced Drawing. 3 credits
Prerequisite: ART 450.

ART 651—Advanced Projects: Studio. 3, 6, or 9 credits
Prerequisite: A major in fine arts. Advanced projects in ceramics, drawing, painting, printmaking, creative photography, and/or sculpture.

ART 655—Research in Methods and Materials of the Artist. 3 or 6 credits
Prerequisite: ART 303. Research in the history, use and characteristics of the artist's materials.

ART 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# BUILDING CONSTRUCTION

## GRADUATE FACULTY 1966–67

Johnson, L. A., *Chairman;* Halperin, D. A.; Prugh, B. J.; Williamson, H. D.; Zeigler, C. D.

Courses are offered leading to the degree of Master of Science in Building Construction. Specialization may be in building construction, building research or structural design of buildings. Holders of the four-year undergraduate degree in building construction or its equivalent may normally complete the requirements for the master's degree in one academic year.

The Department reserves the right to retain student work for purposes of record, exhibition or instruction.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

BCN 502—Construction Planning and Control. 3 credits

BCN 503—Advanced Construction Techniques. 3 credits

## GRADUATE COURSES

BCN 601—Building Construction. 5 to 10 credits
Advanced studies in building technology or in specialized areas of the building construction field selected by the student and approved by the faculty. May be repeated with change of content up to a maximum of 10 credits.

BCN 602—Building Construction. 5 to 10 credits
Continuation of BCN 601. May be repeated with change of content up to a maximum of 10 credits.

BCN 603—Building Research. 5 to 10 credits
Detailed investigation of a selected problem in the building construction field designed to make a significant contribution to present knowledge and practices in that field. May be repeated with change of content up to a maximum of 10 credits.

BCN 604—Building Research. 5 to 10 credits
Continuation of BCN 603. May be repeated with change of content up to a maximum of 10 credits.

BCN 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# COLLEGE OF ARTS AND SCIENCES

GENERAL

ANTHROPOLOGY

ASTRONOMY

BIOLOGICAL SCIENCES
(See Biological Sciences, Division of)

CHEMISTRY

ENGLISH

FOREIGN LANGUAGES
French
German
Latin
Portuguese
Spanish

GEOGRAPHY

GEOLOGY

HISTORY

LATIN AMERICAN STUDIES

LIBRARY SCIENCE

MATHEMATICS

PHILOSOPHY

PHYSICS

POLITICAL SCIENCE

PSYCHOLOGY

SOCIOLOGY

SPEECH

ZOOLOGY

SCHOOL OF JOURNALISM AND COMMUNICATIONS
Communications
Journalism

# ARTS AND SCIENCES—GENERAL

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ASC 501—The History of Science. 3 credits
ASC 542—History of Biological Science. 3 credits

## GRADUATE COURSES

ASC 641—Internship in College Teaching. 3 credits
Prerequisite: Permission of the graduate major department. Required of all candidates for the Master of Arts in Teaching and the Master of Science in Teaching degrees.
ASC 642—Internship in College Teaching. 3 credits
Continuation of ASC 641. May be taken concurrently with ASC 641.
ASC 643—Internship in College Teaching. 3 credits
Continuation of ASC 642. May be taken concurrently with ASC 642.

# ANTHROPOLOGY

## GRADUATE FACULTY 1966–67

Fairbanks, C. H., *Chairman;* Carter, W. E.; Ford, J. A.; Gavan, J. A.; Kimball, S. T.; Markel, N. N.; Nunez, T. A., Jr.; Robinson, S. A.; Taylor, C. D.

Graduate work leading to the Master of Arts degree is offered in the following fields of anthropology: social anthropology, ethnology, archeology, physical anthropology and linguistics.

The Bachelor of Arts degree in anthropology is not required for admission to graduate work in the department, but students without such preparation should expect to make up any deficiencies in background information. A reading knowledge of one modern foreign language is required for the Master of Arts degree.

The normal distribution of work is as follows: (1) APY 601, APY 602, APY 603; (2) at least 27 credits in anthropology courses approved for graduate credit; (3) a minimum of 9 credits in a related field as a minor; (4) registration in APY 699 is normally required.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

APY 500—Field Sessions in Archeology. 10 credits
APY 501—Principles of Archeology. 6 credits
APY 503—Systems of Kinship and Descent. 4 credits
APY 504—Social Organization. 4 credits
APY 506—Language and Culture. 4 credits
APY 507—Culture and Personality 1. 4 credits
APY 508—Culture and Personality 2. 4 credits
APY 515—The Evolution of Culture. 4 credits
APY 539—Native Peoples of South America. 4 credits
APY 541—Native Peoples of Mexico, Central America and the Caribbean. 4 credits

APY 561—Methods in Field Ethnology 1. 4 credits
APY 562—Methods in Field Ethnology 2. 4 credits
APY 580—Anthropological Theory. 4 credits
APY 581—Current Anthropological Theory. 4 credits

## GRADUATE COURSES

APY 601—Principles of Anthropology. 3 credits
Physical anthropology, anthropological linguistics, world prehistory. Emphasis on the theoretical principles of each division and their interrelationships.

APY 602—Principles of Cultural Anthrology. 3 credits
Nature of culture, social organization, culture and personality. Prevalent theoretical orientations in topical and area studies with emphasis on cultural dynamics.

APY 603—Principles of Political & Economic Anthropology. 3 credits
Emphasis on theories of culture and culture change as they apply to the relations of non-western political and economic systems to emergent cultures.

APY 610—Medical Anthropology. 3 credits
Prerequisite: SY 556 or consent of instructor. The theory of anthropology as applied to nursing, medicine, hospital organization, and the therapeutic environment. Course includes instrument design and techniques of material collection.

APY 611—Advanced Archeological Field Methods. 9 credits
Prerequisites: APY 300, APY 500, APY 501. Planning, directing and reporting archeological excavations. Students are encouraged to prepare publishable papers.

APY 621—Seminar in Archeology. 4 credits
Prerequisite: APY 501. A seminar in a selected archeological topic. May be repeated with change of content to maximum of 12 credits.

APY 622—Seminar in Ethnology. 4 credits
Prerequisite: APY 504. A seminar in a selected archeological topic. Areas treated are North America, Central America, South America, Africa, Oceania. May be repeated with change of content to maximum of 12 credits.

APY 630—Individual Work. 3 to 5 credits
Guided readings on research in anthropology based on library, laboratory or fieldwork. May be repeated with change of content to maximum of 15 credits.

APY 655—Culture Change 1. 3 credits
Prerequisite: APY 200 or APY 300. Factors and forces that precipitate change through the contact of different cultures or in the systems and institutions of a single culture.

APY 656—Culture Change 2. 3 credits
Prerequisite: APY 655. Emphasizes theory and methods of directed culture change and applied anthropology, traditional cultures and technological change. Examination of numerous case histories.

APY 661—Anthropology and Education. 3 credits
Comparative study of the teaching and learning processes in societies of differing complexity and cultural variability. Empirical data examined from an anthropological perspective and in the context of theories about culture and perception, world view, rites of passage, culture and personality and change.

APY 667—Culture and Community. 3 credits
Prerequisite: 15 to 20 credits in social sciences. An examination of the method and theory of the empirical, inductive, natural history approach in the study of communities. Existing community studies will be utilized to provide comparative analyses of social structure, culture patterns and process of change.

APY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# ASTRONOMY

## GRADUATE FACULTY 1966–67

SMITH, A. G., *Chairman;* CARR, T. D.; CHEN, K. Y.; GREEN, A. E. S.; OMER, G. C.

Graduate work in astrophysics at both the master's and doctoral levels is offered through the Department of Physics and Astronomy, with specialization in radio astronomy, cosmology, or photoelectric photometry. The degree offered is a joint degree in physics and astronomy.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ATY 503—HISTORY OF ASTRONOMY. 3 credits
ATY 510—GEOASTROPHYSICS 1. 3 credits
ATY 511—GEOASTROPHYSICS 2. 3 credits

## GRADUATE COURSES

ATY 605—STELLAR ASTROPHYSICS 1. 3 credits
Prerequisites: ATY 316, ATY 317. Theoretical and observational approach to evolution, dynamics and equilibria of stars and star systems.

ATY 606—STELLAR ASTROPHYSICS 2. 3 credits
Prerequisite: ATY 605. Continuation of ATY 605.

ATY 607—STELLAR ASTROPHYSICS 3. 3 credits
Prerequisite: ATY 606. Continuation of ATY 606.

ATY 608—GALACTIC STRUCTURE. 3 credits
The study of the kinematics and dynamics of the galaxy.

ATY 611—RADIO ASTRONOMY 1. 3 credits
Prerequisites: ATY 316, ATY 317. Corequisites: PS 510 and PS 515. Measurement parameters; instrumentation of radio and radar astronomy; emission mechanism theories; radio propagation in plasmas; observational results of radio and radar astronomy and their interpretation.

ATY 612—RADIO ASTRONOMY 2. 3 credits
Prerequisite: ATY 611. Continuation of ATY 611.

ATY 613—RADIO ASTRONOMY 3. 3 credits
Prerequisite: ATY 612. Continuation of ATY 612.

ATY 631—EXTRAGALACTIC ASTRONOMY AND COSMOLOGY. 3 credits
A survey of the methods of modern cosmology; cosmological models.

ATY 636—PHYSICS OF PLANETARY ATMOSPHERES 1. 3 credits
Identical with PS 636. Prerequisites: Basic physics courses and mathematics courses through integral calculus. Planetary aeronomy, Newtonian dynamics and the solar system, atomic and quantum theory, solar-terrestrial relations, plasmas in space.

ATY 637—PHYSICS OF PLANETARY ATMOSPHERES 2. 3 credits
Identical with PS 637. Prerequisite: ATY 636. Fundamental background for advanced topics, quantum mechanics and the central field problem, atomic spectroscopy, molecular energy levels and spectra, radiative transfer in planetary and stellar atmospheres.

ATY 638—PHYSICS OF PLANETARY ATMOSPHERES 3. 3 credits
Identical with PS 638. Prerequisite: ATY 637. Advanced topics, space spectroscopy, the infrared, the ultraviolet through x-ray region, the radio region, new instruments, magnetometers, masers, lasers, re-entry and other field applications.

ATY 690—Individual Work. 3 credits
Supervised study or research in areas not covered by other graduate courses. May be repeated with change of content up to a maximum of 9 credits.

# CHEMISTRY

## GRADUATE FACULTY 1966–67

Sisler, H. H., *Chairman;* Battiste, M. A.; Baxter, J. F.; Black, A. P.; Brey, W. S., Jr.; Brown, H. C.; Butler, G. B.; Colgate, S. O.; Deyrup, J. A.; Dresdner, R. D.; Hanrahan, R. J.; Helling, J. F.; Jones, W. M.; Löwdin, P. O.; Muga, M. L.; Muschlitz, E. E., Jr.; Ohrn, Y. N.; Person, W. B.; Reid, C. E.; Ryschkewitsch, G. E.; Schmid, G. M.; Simons, J. H.; Slater, J. C.; Smith, D. W.; Stearns, T. W.; Stoufer, R. C.; Tarrant, P.; Weltner, W., Jr.; Winefordner, J. D.; Zoltewicz, J. A.

New graduate students should have adequate undergraduate training in inorganic, analytical, organic and physical chemistry. Normally this will include as a minimum a year of general chemistry which may include qualitative analysis, one quarter of quantitative analysis, one year of organic chemistry, one year of physical chemistry and one quarter of advanced inorganic chemistry. Additional courses in advanced physical and organic chemistry are desirable. Deficiencies in any of these areas may be corrected during the first year of graduate study. Such deficiencies are determined by a series of placement tests given prior to registration, and the results of these tests are used in planning the student's program.

Courses for the master's degree are chosen in terms of the student's interest with the approval of his supervisory committee. These courses usually include some of those listed in the next paragraph which are the first courses in the indicated fields. The master's degree in chemistry requires a thesis. The degree Master of Science in Teaching is offered with specialization in chemistry.

All doctoral candidates are required to take a series of basic courses in at least three of the four areas of chemistry indicated below unless taking the chemical-physics option. The areas and the required courses in each area are as follows: physical chemistry, any two 600-level courses in physical chemistry; organic chemistry, CY 661; analytical chemistry, CY 635, CY 636 or CY 637; and inorganic chemistry, CY 611.

A chemical-physics option is offered for students who will be doing research in areas of physical chemistry which require a strong background in physics. In addition to courses in chemistry, a minimum of 22 credits in 400-level or higher physics courses or a minimum of 12 such credits in physics and 12 in 400-level or higher mathematics (exclusive of differential equations) courses is required. However, basic chemistry courses need be taken in only two of the four areas mentioned in the previous paragraph.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

CY 511—Inorganic Chemistry. 3 credits
CY 540—Quantum Theory of Matter 1. 3 credits
CY 542—Physical Chemistry. 3 credits

CY 543—Advanced Physical Chemistry Laboratory. 3 credits
CY 550—Introduction to Nuclear Chemistry. 3 credits
CY 564—Organic Chemistry. 5 credits
CY 590—Individual Problems. 3 credits

## GRADUATE COURSES

CY 600—Chemical Bonding and Spectra. 5 credits
Introductory quantum chemistry of atoms and molecules; chemical applications of the theory of symmetry; molecular orbital treatment of simple inorganic and organic molecules; electronic and vibrational spectra and selection rules.

CY 610—Inorganic Preparations. 5 credits
Lectures and laboratory experiments to acquaint the student with the reactions and techniques used in the synthesis of inorganic compounds.

CY 611—Structural Inorganic Chemistry. 3 credits
Modern theories of molecular structure as applied to inorganic systems, with emphasis on symmetry properties, coordination compounds.

CY 612—Structural Inorganic Chemistry. 3 credits
Continuation of CY 611. Reactivities of inorganic compounds. Nonaqueous solvents, oxidation-reduction, inorganic reaction mechanisms.

CY 615—Advanced Inorganic Chemistry. 3 credits
Prerequisite: CY 612. A systematic study of the nonmetals, with emphasis on the relation of properties to atomic, molecular and crystal structures.

CY 616—Advanced Inorganic Chemistry. 3 credits
Prerequisite: CY 612. A systematic study of the metals, with emphasis on the relation of properties to atomic, molecular and crystal structures. Special attention given to the nuclear fission product elements.

CY 617—Special Topics in Inorganic Chemistry. 3 credits
Lectures or conferences pertaining to selected topics of current research interest in inorganic chemistry. May be repeated with change of content up to a maximum of 15 credits.

CY 629—Chemical Physics. 3 credits
Identical with PS 629.

CY 635—Advanced Separations and Analytical Techniques. 4 credits
Principles of single stage and multistage separation methods; principles of volumetric methods of analysis; experimental design and data interpretation.

CY 636—Spectrochemical Methods of Analysis. 4 credits
Principles of atomic and molecular absorption and emission spectroscopy as applied to qualitative and quantitative analysis.

CY 637—Electrochemistry. 4 credits
Potentials, electrical double layer theory, principles of electrochemical kinetics, analytical applications.

CY 638—Analytical Chemistry Seminar. 1 credit
Prerequisites: One graduate course in analytical chemistry and consent of instructor. Presentation of one seminar. Seminar attendance required of graduate majors in the analytical area. May be repeated for credit.

CY 641—Chemical Thermodynamics. 3 credits
Energetics, properties of ideal and nonideal systems primarily from the standpoint of classical thermodynamics.

CY 642—Kinetic Theory. 3 credits
Prerequisite: CY 641. Classical statistics, the Maxwell-Boltzmann distribution, molecular collision dynamics, elements of transport theory, virial theorem, intermolecular forces.

CY 643—STATISTICAL THERMODYNAMICS. 3 credits
Prerequisite: CY 642. A development of the fundamental principles of statistical thermodynamics with applications to systems of chemical interest.

CY 644—CHEMICAL KINETICS. 4 credits
Prerequisite: One course of graduate physical chemistry or consent of instructor. Rates and mechanism of chemical reaction.

CY 645—INTRODUCTION TO MOLECULAR SPECTROSCOPY. 4 credits
Prerequisite: CY 600. Electronic structure of the atom; spectroscopic selection rules; molecular rotational, and electronic spectra; introduction to group theory.

CY 646—QUANTUM THEORY OF MATTER 2. 3 credits
Identical with PS 646. Prerequisite: CY 540. Angular momentum vectors in wave mechanics, spin-orbitals, antisymmetry and the determinantal method, and the Hartree-Fock equations. The helium atom, exchange and correlation. The hydrogen molecule-ion and molecule, Heitler-London and molecular orbital methods. General method of molecular orbitals.

CY 650—SPECIAL TOPICS IN PHYSICAL CHEMISTRY. 3 credits
Lectures or conferences covering selected topics of current interest in physical chemistry. May be repeated with change of content up to a maximum of 15 credits.

CY 652—QUANTUM THEORY OF MATTER 3. 3 credits
Identical with PS 652. Prerequisite: CY 646. Group theory and symmetry of wave functions, with Bloch's method for periodic systems. Structure of simple polyatomic molecules, interpretation of molecular bonds. Symmetry properties of crystals, the reciprocal lattice, Brillouin zones. Caculation of energy bands in crystals by linear combination of atomic orbitals, plane-wave expansion, augmented plane waves. Results of energy band calculations, distinction between insulators, semiconductors, and metals, with experimental methods of investigating energy bands and Fermi surfaces.

CY 653—PHYSICAL CHEMISTRY OF SURFACES. 3 credits
Prerequisite: CY 641. Study of the liquid-gas and solid-gas interface; adsorption and heterogeneous catalysis.

CY 654—COLLOIDS. 2 credits
Methods of preparation and characteristics of colloidal dispersions; optical, kinetic, electrokinetic, and rheological properties of colloidal and macromolecular systems.

CY 655—ELEMENTS OF QUANTUM CHEMISTRY. 3 credits
A brief treatment of the Schrodinger equation, followed by a survey of applications to chemical problems.

CY 657—NUCLEAR CHEMISTRY. 3 credits
Prerequisite: CY 550 or consent of instructor. Radioactivity, nuclear structure, decay processes, nuclear reactions.

CY 658—RADIATION CHEMISTRY. 2 credits
Prerequisite: CY 644. Chemical and physical effects caused by ionizing radiations. Kinetics and mechanism of radiation-induced reactions.

CY 659—PHOTOCHEMISTRY. 2 credits
Prerequisite: CY 644. Experimental and theoretical aspects of chemical reactions induced by visible and ultraviolet radiation. Fluorescence and chemiluminescence.

CY 660—ORGANIC PREPARATIONS. 4 credits
Lectures and laboratory to acquaint the student with the reactions and techniques used in synthesis of organic compounds.

CY 661—Advanced Organic Chemistry. 3 credits
Prerequisites: CY 373, CY 564. Advanced organic chemistry intended to present a useful interpretation of descriptive fact and unifying theory.

CY 662—Advanced Organic Chemistry. 3 credits
Continuation of CY 661.

CY 663—Advanced Organic Chemistry. 2 credits
Continuation of CY 662.

CY 668—Chemistry of High Polymers. 2 credits
A fundamental approach to the chemistry of high polymers, with emphasis on the mechanisms of polymerization reactions and the relationship of physical properties to chemical constitution.

CY 669—High Polymer Chemistry Laboratory. 2 credits
Prerequisite or corequisite: CY 668. Consists of two three-hour laboratories per week or their equivalent. Preparation of representative members of the high polymer family and determination of their physical properties, methods of polymerization and determination of fundamental polymer properties.

CY 670—Organic Chemistry Seminar. 1 credit
Prerequisites: CY 661, CY 662, CY 663, and consent of instructor. Presentation of one seminar and seminar attendance required of graduate majors in the organic area. May be repeated for credit.

CY 671—Physical-Organic Chemistry. 2 credits
The theory and application of physical methods in the study of the behavior of organic compounds.

CY 672—Organic Fluorine Chemistry. 3 credits
The preparation and properties of compounds containing fluorine, with particular reference to carbon compounds.

CY 673—Organometallic Compounds. 2 credits
Prerequisites: CY 661, CY 662, CY 663. Factors influencing the properties of organometallic compounds, the nature of the carbon-metal bond, compounds of the alkali metals, compounds of Group II metals, compounds of Group III elements, silanes and compounds of tin and lead.

CY 674—Free Radical Reactions. 2 credits
Prerequisites: CY 661, CY 662, CY 663. The development and correlation of experimental methods, fact and theory of reactions involving organic free radicals.

CY 675—The Chemistry of Heterocyclic Compounds. 2 credits
Prerequisites: CY 661, CY 662, CY 663.

CY 676—Organic Reaction Mechanisms. 3 credits
Prerequisites: CY 661, CY 662, CY 663. An integrated study of ionic reaction mechanisms with emphasis on transition state theory, electronic effects and stereochemical consequences of these reactions.

CY 677—Special Topics in Organic Chemistry. 2 credits
Prerequisites: CY 661, CY 662. The chemistry of selected types of organic compounds, such as alkaloids, carbohydrates, natural products, steroids.

CY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

CY 756—Theory of Atomic and Molecular Structure 1. 3 credits
Identical with PS 756. Prerequisite: CY 646 or PS 643. First half of CY 756, 757. Mathematical techniques used in atomic, molecular, and solid-state theory. The one-electron approximation and the general quantum-mechanical many-body problem. Selected advanced topics.

CY 757—Theory of Atomic and Molecular Structure 2. 3 credits
Identical with PS 757. Continuation of CY 756.

CY 799—Doctoral Research. 1 to 12 credits

# ENGLISH

## GRADUATE FACULTY 1966–67

HARPER, G. M., *Chairman;* ALGEO, J. T.; BAUGHAN, D. E.; BIGELOW, G. E.; BOWERS, R. H., JR.; BRYAN, R. A.; CHILDERS, W. C.; COX, E. H.; FAIN, J. T.; HELLSTROM, W.; HERBERT, T. W.; KIRKLAND, E. C.; LISCA, P.; MORRIS, A. C.; MURPHREE, A. A.; ORAS, A.; PICKARD, J. B.; PRESTON, T. R.; ROSCELLI, W. J.; RUFF, W.; STRYKER, P. D.; THURSTON, P. T.; WARFEL, H. R.; WILLIAMS, A. L.

*Prerequisite:* An undergraduate major in English or its equivalent. Such a major must present at least 24 credits of English, including courses in important periods of English literary history, American literature and the history of the English language. Adequate preparation in such closely related fields as history, philosophy and foreign language is presupposed.

EH 685 is required of all graduate majors. In addition to a reading knowledge of French and German normally required for doctoral candidates, the candidate for the Doctor of Philosophy in English must also on entrance or before his qualifying examination offer evidence of elementary study of either Latin or Greek.

The Department of English offers work leading to the degrees of Master of Arts in Teaching, Master of Arts and Doctor of Philosophy. One of the programs for the Master of Arts in Teaching is designed to prepare those who wish to teach English as a second language. With the approval of the departmental adviser, graduate study in the field of folklore may be made available by registration in EH 686. Students wishing to take graduate work should consult the departmental graduate advisers. A booklet descriptive of the doctoral program is available upon application to the department.

Candidates for the Master of Arts in Teaching will take courses entitled ASC 641, ASC 642, ASC 643. These courses are also available to candidates for the Master of Arts and the Doctor of Philosophy who may need teaching experience as part of their preparation.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EH 530—INDIVIDUAL WORK IN CREATIVE WRITING. 3 credits

EH 599—SPECIAL STUDY IN ENGLISH. 3 credits

## GRADUATE COURSES

EH 601—THE ENGLISH LANGUAGE TO 1400. 3 credits
The origins and development of the English language.

EH 602—THE ENGLISH LANGUAGE SINCE 1400. 3 credits

EH 603—OLD ENGLISH: LANGUAGE. 3 credits
Old English grammar and reading from selected monuments.

EH 604—MIDDLE ENGLISH: LANGUAGE. 3 credits
Middle English grammar and reading from selected monuments.

EH 605—DESCRIPTIVE LINGUISTICS: PHONEMICS. 3 credits
The theory and procedures of descriptive linguistics.

EH 606—DESCRIPTIVE LINGUISTICS: MORPHEMICS AND SYNTAX. 3 credits
The theory and procedures of descriptive linguistics.

EH 611—20TH-CENTURY ENGLISH LITERATURE. 3 credits
Selection and intensive examination of representative authors.
EH 621—OLD ENGLISH: LITERATURE. 3 credits
Survey of Old English literary types and schools.
EH 622—BEOWULF. 3 credits
EH 623—MIDDLE ENGLISH: LITERATURE. 3 credits
Prerequisite: Course in Chaucer at 400- or 500-level.
EH 624—CHAUCER: *Troilus and Criseyde.* 3 credits
Reading and critical study of *Troilus and Criseyde* and the minor poems.
EH 625—CHAUCER: *The Canterbury Tales.* 3 credits
EH 631—THE RENAISSANCE IN ENGLAND: THE BEGINNINGS. 3 credits
From the beginnings of humanism to Sir Philip Sidney and Edmund Spenser.
EH 632—THE RENAISSANCE IN ENGLAND: THE FLOWERING. 3 credits
Late Elizabethan and earlier Jacobean literature—from about 1590 to about 1620.
EH 633—THE RENAISSANCE IN ENGLAND: THE LATE RENAISSANCE. 3 credits
From about 1620 to the Restoration.
EH 634—MILTON. 3 credits
EH 635—SPENSER. 3 credits
EH 636—PRE-SHAKESPEAREAN DRAMA: BEGINNINGS THROUGH MARLOWE. 3 credits
Beginning with Greek drama and Homer, problems associated with liturgical plays, plays of saints' lives and the great plays of the Elizabethan period.
EH 637—LATE RENAISSANCE DRAMA: BETWEEN MARLOWE AND THE CLOSING OF THE THEATRES. 3 credits
Plays of Dekker, Massinger, Jonson, Beaumont, Fletcher, Chapman, Ford, Middleton, Shirley, Brome, will be studied.
EH 638—SHAKESPEARE: THE EARLY PLAYS. 3 credits
The early comedies, histories and tragedies.
EH 639—SHAKESPEARE: THE LATER PLAYS. 3 credits
The late comedies, histories, and tragedies.
EH 641—THE AGE OF DRYDEN. 3 credits
Prose, poetry and drama in the period 1660 to 1700.
EH 642—THE AGE OF POPE. 3 credits
Poetry, prose and drama from 1700 to 1744.
EH 643—THE AGE OF JOHNSON. 3 credits
Prose, poetry and drama from 1745 to 1800.
EH 644—RESTORATION DRAMA. 3 credits
Plays by Dryden, Etherege, Wycherley, Otway, Vanbrugh, Congreve and others.
EH 645—18TH-CENTURY DRAMA. 3 credits
Survey of English stage from Addison to Sheridan.
EH 651—ROMANTICISM: BURNS, BLAKE, SCOTT. 3 credits
EH 652—ROMANTICISM: COLERIDGE, WORDSWORTH, LAMB. 3 credits
EH 653—ROMANTICISM: BYRON, SHELLEY, KEATS. 3 credits
EH 661—THE VICTORIAN PERIOD: POETRY. 3 credits
EH 662—THE VICTORIAN PERIOD: NON-FICTIONAL PROSE. 3 credits
EH 663—THE VICTORIAN PERIOD: FICTION. 3 credits
EH 671—AMERICAN LITERATURE: COLONIAL AND EARLY NATIONAL. 3 credits
EH 672—AMERICAN LITERATURE: HAWTHORNE THROUGH WHITMAN. 3 credits
EH 673—AMERICAN LITERATURE: TWAIN THROUGH DREISER. 3 credits

EH 674—American Literature: Since World War I. 3 credits
EH 681—The English Novel. 3 credits
EH 682—Literary Criticism: Classical Through Renaissance. 3 credits
EH 683—Literary Criticism: 18th Century to Present. 3 credits
EH 684—Prosody. 3 credits
EH 685—Bibliography and Methods of Research. 0 credit
EH 686—Individual Work. 3 credits
For graduate students majoring in English and needing work in subjects not available in currently offered courses. Limited to small groups in actual residence. May be repeated with change of content up to a maximum of 9 credits.
EH 699—Master's Research. 0 to 9 credits. Maximum 24 credits
EH 701—Seminar in Linguistics. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 711—Seminar in 20th-Century English Literature. 3 credits
EH 712—Seminar in Contemporary English and American Literature: Variable Topics. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 721—Seminar in Medieval Literature. 3 credits
Topics embrace Old English literature and Middle English literature including Chaucer. May be repeated with change of content up to a maximum of 9 credits.
EH 731—Seminar in Shakespeare. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 732—Seminar in Renaissance Literature. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 741—Seminar in Restoration and Early 18th-Century Literature. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 742—Seminar in Late 18th-Century Literature. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 751—Seminar in Romanticism. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 761—Seminar in Victorian Literature. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 771—Seminar in 19th-Century American Literature. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 772—Seminar in 20th-Century American Literature. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 773—Seminar in American Literature: Variable Topics. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 781—Seminar in English Drama. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
EH 799—Doctoral Research. 1 to 12 credits

# FOREIGN LANGUAGES

## GRADUATE FACULTY 1966-67

Conner, J. W., *Chairman;* Abraham, C. K.; Allen, J. J.; Aratowsky, B.; Bonneville, D. A.; Brunet, J.; Craps, J. E.; Hayes, F. C.; Hower, A.; Jones, O. F.; Lasley, M. M.; Mauderli, M. O.; Valk, M. E.; Wallace, M. J.; Wershow, I. R.

The department offers work leading to the master's degree in French, German, Latin, and Spanish; and to the Ph.D. degree in Romance languages, with major in French or Spanish. In addition, sufficient courses for a graduate minor are available in Portuguese, Russian, and Greek.

The *prerequisite* for admission to graduate work is an undergraduate major in the language, including advanced courses in both literature and language. A good foundation in a second language is desirable.

For admission to candidacy for the Ph.D. degree, students must demonstrate a reading knowledge of German and Latin, as well as proficiency in two Romance languages.

### GRADUATE COURSES

FLE 619—Introduction to Romance Linguistics. 4 credits
Comparative study of the major Romance languages and their development from Latin.

FLE 625—Medieval Romance Lyric Poetry. 3 credits
A close reading of representative lyrics, with careful attention to their cultural setting and to problems of origin and influence.

## FRENCH

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

FH 504—French Phonetics. 3 credits
FH 505—Advanced French Composition. 3 credits
FH 506—The Structure of French. 3 credits
FH 512—History of the French Language. 3 credits
FH 521—17th-Century French Prose. 3 credits
FH 522—17th-Century French Poetry. 3 credits
FH 523—17th-Century French Drama. 3 credits
FH 530—The Philosophic Movement. 3 credits
FH 531—The Novel of the 18th Century. 3 credits
FH 542—The Romantic Period. 3 credits
FH 545—French Realism and Naturalism. 3 credits
FH 550—Modern French Poetry. 3 credits
FH 560—20th-Century French Literature. 3 credits

### GRADUATE COURSES

FH 103—Beginning French for Graduate Students. 0 credit
Prerequisite: Graduate status. For students with no formal preparation in French who need to acquire a reading knowledge.

FH 600—Special Study in French Literature. 3 credits
Intensive study of a selected topic or problem (varied each quarter). May be repeated with change of content up to a maximum of 15 credits.

FH 605—Individual Work. 1 to 3 credits
Available only by special arrangement with a graduate adviser. May be repeated with change of content up to a maximum of 15 credits.

FH 610—Introduction to Graduate Study and Research. 3 credits
The tools, problems and methods of literary and linguistic research.

FH 615—Literary Criticism in France. 3 credits
FH 618—Old French Literature 1. 3 credits
FH 619—Old French Literature 2. 3 credits

FH 620—FRENCH POETRY OF THE RENAISSANCE. 3 credits
FH 621—FRENCH PROSE OF THE RENAISSANCE. 3 credits
FH 641—BAROQUE AND PRECLASSICISM. 3 credits
FH 645—FRENCH CLASSICAL COMEDY. 3 credits
FH 660—THE FRENCH SYMBOLIST MOVEMENT. 3 credits
FH 670—CONTEMPORARY FRENCH NOVEL. 3 credits
FH 671—CONTEMPORARY FRENCH THEATER. 3 credits
FH 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits
FH 799—DOCTORAL RESEARCH. 1 to 12 credits

## GERMAN

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

GN 512—HISTORY OF THE GERMAN LANGUAGE. 3 credits
GN 513—GERMAN LYRIC POETRY. 3 credits
GN 528—AUFKLÄRUNG AND STURM UND DRANG. 3 credits
GN 529—GERMAN CLASSICAL PERIOD. 3 credits
GN 530—GERMAN ROMANTIC PERIOD. 3 credits
GN 540—GERMAN DRAMA OF THE 19TH CENTURY. 3 credits
GN 545—GERMAN PROSE FICTION OF THE 19TH CENTURY. 3 credits
GN 560—20TH-CENTURY GERMAN LITERATURE. 3 credits

### GRADUATE COURSES

GN 103—BEGINNING GERMAN FOR GRADUATE STUDENTS. 0 credit
Prerequisite: Graduate status. For students with no formal preparation in German who need to acquire a reading knowledge.

GN 600—SPECIAL STUDY IN GERMAN LITERATURE. 3 credits
Intensive study of a selected topic or problem (varied each quarter). May be repeated with change of content up to a maximum of 15 credits.

GN 604—GOETHE. 3 credits
GN 605—INDIVIDUAL WORK. 1 to 3 credits
Available only by special arrangement with a graduate adviser. May be repeated with change of content up to a maximum of 15 credits.

GN 620—GOTHIC. 3 credits
GN 624—INTRODUCTION TO OLD ICELANDIC. 3 credits
GN 625—READINGS IN OLD ICELANDIC. 3 credits
GN 637—MIDDLE HIGH GERMAN. 3 credits
GN 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

## LATIN

### COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

LN 599—SPECIAL STUDY IN LATIN. 3 credits

### GRADUATE COURSES

LN 600—SPECIAL STUDY IN LATIN LITERATURE. 3 credits
Sample topics: Horace, Juvenal, Roman Comedy, Roman Historians. May be repeated with change of content up to a maximum of 15 credits.

LN 620—HISTORY OF THE LATIN LANGUAGE. 3 credits
LN 630—INDIVIDUAL WORK. 3 credits
Readings, conferences and reports. Subjects in language, literature and civiliza-

tion for which there are no special course offerings. May be repeated with change of content up to a maximum of 15 credits.

LN 699—Master's Research. 0 to 9 credits. Maximum 24 credits

## PORTUGUESE

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

PE 551—Machado de Assis and His Contemporaries. 3 credits
PE 552—Eca de Queiros and His Contemporaries. 3 credits

### GRADUATE COURSES

PE 600—Special Study in Brazilian or Portuguese Literature. 3 credits

Intensive study of a selected topic or problem (varied each quarter). May be repeated with change of content up to a maximum of 15 credits.

PE 651—The 19th-Century Brazilian Novel. 3 credits
PE 652—The 20th-Century Brazilian Novel. 3 credits
PE 653—Brazilian Poetry and Drama to 1900. 3 credits
PE 654—Brazilian Poetry and Drama since 1900. 3 credits
PE 660—Medieval and Renaissance Portuguese Literature. 3 credits

May be repeated with change of content up to a maximum of 15 credits.

## SPANISH

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

SH 504—Spanish Phonetics. 3 credits
SH 505—Advanced Composition and Syntax. 3 credits
SH 506—The Structure of Spanish. 3 credits
SH 512—History of the Spanish Language. 3 credits
SH 513—Spanish Lyric Poetry. 3 credits
SH 521—Spanish Drama of the Golden Age. 3 credits
SH 522—Spanish Prose Fiction of the Golden Age. 3 credits
SH 531—Spanish Drama of the 19th Century. 3 credits
SH 532—Spanish Novel of the 19th Century. 3 credits
SH 541—The Generation of '98. 3 credits
SH 550—Contemporary Spanish Literature. 3 credits
SH 575—Introduction to Spanish-American Literature 1. 3 credtis
SH 576—Introduction to Spanish-American Literature 2. 3 credits
SH 577—Spanish-American Prose Fiction. 3 credits

### GRADUATE COURSES

SH 600—Special Study in Spanish or Spanish-American Literature. 3 credits

Intensive study of a selected topic or problem (varied each quarter).

SH 605—Individual Work. 1 to 3 credits

Available only by special arrangement with a graduate adviser. May be repeated with change of content up to a maximum of 15 credits.

SH 610—Introduction to Graduate Study and Research. 3 credits

The tools, problems, and methods of literary and linguistic research.

SH 618—Old Spanish Literature 1. 3 credits
SH 619—Old Spanish Literature 2. 3 credits

SH 625—Spanish Poetry of the Golden Age. 3 credits
SH 635—Lope de Vega and His Contemporaries. 3 credits
SH 637—Cervantes 1. 3 credits
SH 638—Cervantes 2. 3 credits
SH 640—The Picaresque Novel. 3 credits
SH 655—Gaucho Literature. 3 credits
SH 660—The Modernist Movement. 3 credits
SH 665—The Spanish-American Essay. 3 credits
SH 667—Contemporary Spanish-American Novel. 3 credits
SH 685—Contemporary Spanish Novel. 3 credits
SH 686—Contemporary Spanish Theater. 3 credits
SH 699—Master's Research. 0 to 9 credits. Maximum 24 credits
SH 799—Doctoral Research. 1 to 12 credits

# GEOGRAPHY

## GRADUATE FACULTY 1966-67

Anderson, J. R., *Chairman;* Crist, R. E.; Cross, C. I.; Dunkle, J. R.; Hegen, E. E.; Marcus, R. B.; Niddrie, D. L.; Popenoe, H. L.

Graduate students desiring to take work leading to the degrees of Master of Arts or Master of Science or Doctor of Philosophy must have completed an undergraduate major in geography of not less than 36 credits, or 54 credits in the social sciences, 27 of which were in geography.

All candidates for a graduate degree in geography are expected to take a field course and appropriate seminars. No graduate major may be completed without adequate credits at the 600 level.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

GPY 501—Air Photo Interpretation. 3 credits
GPY 505—Maps and Graphs 1. 2 credits
GPY 506—Maps and Graphs 2. 2 credits
GPY 525—Urban Geography. 3 credits
GPY 535—Land Tenure. 3 credits

## GRADUATE COURSES

GPY 600—History of Geographic Thought 1. 3 credits
Development of geographic knowledge and thought as illustrated by the writings of representative geographers and other scientists in related fields, both past and contemporary.

GPY 601—History of Geographic Thought 2. 3 credits
Continuation of GPY 600.

GPY 603—Geographic Research. 2 credits
Prerequisite: Graduate status with a major or minor in geography. Discussion, application, and critical evaluation of methods of geographic research.

GPY 605—Field Course in Geography. 3 credits
Methods of geographical field work. Observation, classification, interpretation, note-taking, traversing and mapping of data. Areal analysis: land forms, climate, vegetation, soils, resources, settlement patterns and land use.

GPY 606—Individual Field Work. 3 credits
Continuation of GPY 605. May be taken concurrently with GPY 605.

GPY 608—Quantitative Analysis in Geography. 3 credits
Prerequisites: STA 320, GPY 680. An applied course in the use of quantitative methods in geography, with an evaluation of certain statistical techniques in a framework of geographic research.

GPY 614—Problems in Climatology. 3 credits
Climatic conditions and controls; statistical techniques in the analysis of climatic data, with applications in agriculture, commerce, industry and other fields.

GPY 621—Problems in Economic Geography. 3 credits
A lecture and research course analyzing the factors affecting development and spatial arrangement of economic activities. Students are required to make individual studies of selected subjects.

GPY 623—Geography of World Agriculture. 4 credits
World distribution of crops and livestock in relation to natural and cultural conditions; discussion of problems of agriculture in terms of products, economic organization, and agricultural regions; significance in world affairs.

GPY 625—Geography of Underdeveloped Lands. 3 credits
An intensive study of the underdeveloped areas, stressing the possibilities they offer in a rapidly changing and increasingly crowded world.

GPY 630—Individual Work. 1 to 3 credits
Reading or research in areas of geography. May be repeated with change of content up to a maximum of 15 credits.

GPY 635—Land and Water Utilization. 3 credits
Theory and methods of resource-use analysis, resource appraisal and planning. Classification and mapping of land and water uses.

GPY 641—Advanced Political Geography. 3 credits
Influence of geographic factors upon the political development of the world; important theories in political geography; discussion of leading powers.

GPY 681—Seminar: United States and Canada. 3 credits
A research course analyzing the geography of the United States and Canada, with emphasis upon patterns of settlement and the distribution and development of economic activities.

GPY 685—Seminar: Middle America and the Caribbean. 4 credits
A research course emphasizing the cultural, economic, political and resource characteristics and development of representative areas.

GPY 686—Seminar: South America. 4 credits
A research course emphasizing cultural, economic, political, and resource characteristics and development of representative areas.

GPY 688—Resource Utilization and Conservation in Latin America. 3 credits
A regional appraisal of the human and natural resources, and an analysis of the role of resource utilization and conservation in the development of Latin American countries.

GPY 689—Seminar: Land, Man and Migration in Latin America. 2 credits
Physical and cultural factors operative in population movements in Latin America, particularly from cold highlands to hot lowlands, and from rural sectors to metropolitan areas.

GPY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

GPY 799—Doctoral Research. 1 to 12 credits

# GEOLOGY

## GRADUATE FACULTY 1966–67

EDWARDS, R. A., *Acting Chairman;* BLANCHARD, F. N.; BROOKS, H. K.; NICOL, D.; RAPPENECKER, C.

For admission to graduate status in the Department of Geology a student must have a baccalaureate degree with a major in geology or in a related field, with not less than 36 credits in geology. Further requirements are a reading knowledge of one foreign language and either a course in field methods or a summer field course. If the course in field methods or the summer field course is not taken as an undergraduate it may be taken as a graduate student. In addition, a sufficient concentration of courses in a second field of study, to serve as the foundation work for a minor, is recommended.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

GY 500—ADVANCED STUDIES IN GEOLOGY. 3 credits
GY 501—GEOMORPHOLOGY. 3 credits
GY 507—VERTEBRATE PALEONTOLOGY. 4 credits
GY 508—GEOCHEMISTRY 1. 3 credits
GY 511—ECONOMIC GEOLOGY 1. 3 credits
GY 512—ECONOMIC GEOLOGY 2. 3 credits
GY 517—MARINE GEOLOGY. 4 credits
GY 518—OPTICAL CRYSTALLOGRAPHY. 3 credits
GY 527—PRINCIPLES OF STRATIGRAPHY. 3 credits
GY 550—GROUND WATER GEOLOGY. 3 credits
GY 580—DEVELOPMENT OF THE GEOLOGICAL SCIENCES. 3 credits

## GRADUATE COURSES

GY 600—TECTONICS. 3 credits
Prerequisite: GY 409. The characteristics, interrelationships and development of large-scale structural units of the earth's crust.

GY 601—GEOMORPHOLOGY OF SOUTHEASTERN UNITED STATES. 3 credits
Prerequisite: GY 501. Geomorphology of the Atlantic and Gulf Coastal Plain, including the Mississippi Flood Plain and Delta, the Piedmont, Crystalline and Folded Appalachians and southern part of the Appalachian Plateau and adjacent areas.

GY 607—ANCIENT VERTEBRATE FAUNAS. 3 credits
Identical with ZY 607. Prerequisite: ZY 507 or GY 507. Evolution, distribution and extinction of vertebrate faunas with emphasis on problems in paleoecology, paleogeography and patterns of phylogeny.

GY 617—OPTICAL MINERALOGY. 3 credits
Prerequisite: GY 518. Optical properties of crushed fragments of minerals.

GY 618—PETROGRAPHIC MINERALOGY. 3 credits
Prerequisite: GY 518. The study of igneous petrography by use of thin sections.

GY 619—SEDIMENTARY PETROGRAPHY. 3 credits
Prerequisites: GY 518, consent of the instructor. Study of the sedimentary rocks in thin section, with emphasis on their genesis as determined from mineral composition, texture and occurrence.

GY 621—ADVANCED PALEONTOLOGY 1. 3 credits
Paleontology of the Cenozoic Mollusks.

GY 622—Advanced Paleontology 2. 3 credits
Paleontology of the Mesozoic Mollusks.

GY 623—Micropaleontology. 3 credits
The study of Foraminifera, Ostracoda and other microscopic fossils.

GY 624—Paleoecology. 3 credits
Prerequisite: GY 421 or ZY 308. Paleoautecology, paleosynecology, historical biogeography of marine invertebrates and ecological rules as applied to fossil invertebrates.

GY 630—Individual Work. 3 credits
Prerequisite: Consent of instructor. For work beyond that offered in regular courses. May be repeated with change of content up to a maximum of 12 credits.

GY 640—Cenozoic and Mesozoic Stratigraphy. 3 credits
Prerequisite: Consent of instructor. An intensive study of Cenozoic and Mesozoic stratigraphy with special emphasis on the stratigraphy of the Gulf and Atlantic Coastal Plain; American and European relationships.

GY 660—Seminar. 1 credit
Readings in special topics of geology with application to the Coastal Plain. May be repeated with change of content up to a maximum of 3 credits.

GY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# HISTORY

## GRADUATE FACULTY 1966–67

Mahon, J. K., *Chairman;* Aratowsky, B.; Baringer, W. E.; Bushnell, D.; Chalmers, D. M.; Childs, F. S.; Doherty, H. J.; Entner, M. L.; Hammond, E. A.; Hanna, P. L.; MacAulay, N. W., Jr.; McAlister, L. N.; Payne, A. N.; Proctor, S.; Smith, P. H.; Wilensky, N.; Wilson, H. A.; Winius, G. D.

The Master of Arts degree is offered in ancient, medieval, early modern Europe, modern Europe, Britain, United States, Latin America, Far East and Near East. The normal distribution of work is as follows: (1) at least 18 credits in the major field, (2) at least 6 credits in another field of history, (3) HY 602 and 603, Theories and Methods of History, (4) a minor consisting of at least 9 credits in a related discipline, (5) at least 9 credits of HY 699, Master's Research, to be used for the preparation of a required thesis.

The Doctor of Philosophy degree is offered in United States, modern European and Latin American history. Departmental requirements for the degree are: (1) mastery of the field of concentration, (2) thorough competence in two other fields of history, (3) a minor consisting of at least 18 credits in a related discipline, (4) an acceptable dissertation.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

HY 501—History of Science. 3 credits
HY 519—European Thought, 18th Century. 3 credits
HY 520—European Thought, 18th Century to Date. 3 credits
HY 521—European Expansion, 15th, 16th Centuries. 3 credits
HY 522—European Expansion, 17th, 18th Centuries. 3 credits
HY 527—18th-Century Revolutions, 1760 to 1815. 3 credits
HY 528—France, 1600 to 1760. 3 credits

HY 529—Modern France, 1815 to Date. 3 credits
HY 531—Germany, 1800 to 1890. 3 credits
HY 532—Germany, 1890 to Date. 3 credits
HY 538—Africa to 16th Century. 3 credits
HY 539—Modern Africa. 3 credits
HY 540—United States, Cultural and Intellectual, to 1789. 3 credits
HY 541—United States, Cultural and Intellectual, 1789 to 1890 3 credits
HY 542—United States, Cultural and Intellectual, 1890 to Date. 3 credits
HY 543—United States, Military History Through the Civil War. 3 credits
HY 544—United States, Military History from the Civil War to Date. 3 credits
HY 545—United States, 1890 to 1920. 3 credits
HY 546—United States, 1920 to Date. 3 credits
HY 552—Colonial America. 3 credits
HY 560—Spain, 1469 to 1700. 3 credits
HY 561—Spain, 1700 to Date. 3 credits
HY 562—Portugal. 3 credits
HY 570—Caribbean, Colonial Era. 3 credits
HY 571—Caribbean, 19th, 20th Centuries. 3 credits
HY 572—Mexico to 1848. 3 credits
HY 573—Mexico, 1849 to Date. 3 credits
HY 574—Andean Republic, Colombia, Venezuela. 3 credits
HY 575—Peru, Ecuador, Bolivia. 3 credits
HY 576—The Platine Republics. 3 credits
HY 577—Chile. 3 credits
HY 578—Brazil to 1822. 3 credits
HY 579—Brazil, 1822 to Date. 3 credits
HY 581—East Asian Thought. 3 credits
HY 591—Masterpieces in Social Sciences 1. 3 credits
HY 592—Masterpieces in Social Sciences 2. 3 credits
HY 593—Masterpieces in Social Sciences 3. 3 credits
HY 599—Special Studies. 3 credits. Maximum 15 credits

## GRADUATE COURSES

HY 602—Theories and Methods. 3 credits
Required of all candidates for M.A., M.A.T., Ph.D. degrees.

HY 603—Theories and Methods. 3 credits
Continuation of HY 602. Required of all candidates for M.A., M.A.T., Ph.D. degrees.

HY 610—Ancient Civilizations. 3 credits
May be repeated with change of content up to a maximum of 9 credits.

HY 613—The Middle Ages. 3 credits
May be repeated with change of content up to a maximum of 9 credits.

HY 618—Europe, 1500 to 1763. 3 credits
HY 619—European Expansion. 3 credits
HY 620—Seminar on the History of Modern European Thought. 3 credits
May be repeated with change of content up to a maximum of 9 credits.

HY 623—Readings, Modern Europe. 3 credits
There are three sequences: 1763 to 1815; 1815 to 1914; 1914 to date. May be repeated with change of content up to a maximum of 9 credits.
HY 624—Central Europe. 3 credits
HY 625—Modern Western Europe Since 1763. 3 credits
HY 626—Eastern Europe. 3 credits
HY 630—Individual Study. 3 credits
May be repeated with change of content up to a maximum of 15 credits.
HY 633—England. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 639—United States, Social. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 641—Seminar on the History of American Military Policy. 3 credits
May be repeated with change of content up to a maximum of 6 credits.
HY 642—Seminar on American Thought. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 645—The South. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 646—Colonial America. 3 credits
HY 647—United States, 1781 to 1809. 3 credits
HY 648—United States, 1810 to 1837. 3 credits
HY 649—United States, 1838 to 1865. 3 credits
HY 650—United States, 1866 to 1890. 3 credits
HY 651—United States, 1891 to 1920. 3 credits
HY 652—United States, 1921 to 1941. 3 credits
HY 670—Historical Literature of Latin America 1. 3 credits
HY 671—Historical Literature of Latin America 2. 3 credits
Continuation of HY 670.
HY 672—Brazil. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 673—Spanish America. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 699—Master's Research. 0 to 9 credits. Maximum 24 credits
HY 700—Comparative History. 3 credits
May be repeated with change of content up to a maximum of 9 credits.
HY 799—Doctoral Research. 1 to 12 credits

## LATIN AMERICAN STUDIES

For a description of the several graduate degree and certificate programs in Latin American Studies see the section, *Special Programs and Facilities.*

### GRADUATE COURSES

LA 640—Latin American Area Seminar. 5 credits
Prerequisites: Latin American area concentration and consent of instructor. A multidisciplinary approach to Latin American topics. May be repeated with change of content up to a maximum of 15 credits.
LW 695—Latin American Legal Institutions. 3 credits
Selected problems. Conducted with teams of law and graduate students. Reading knowledge of Portuguese or Spanish or French is required.

LA 699—Master's Research. 0 to 9 credits. Maximum 24 credits
LA 799—Doctoral Research. 1 to 12 credits

Registration is limited to students enrolled in Doctor of Philosophy programs in the School of Inter-American Studies prior to the establishment of the Center for Latin American Studies.

# LIBRARY SCIENCE

## GRADUATE FACULTY 1966-67

West, S. L., *Chairman;* Goggin, M. K.; Youngs, M.

LY 615—Advanced Reference and Bibliography. 4 credits

Prerequisite: LY 415. The nature of reference and bibliographic services and resources in the humanities and the social sciences.

LY 625—Advanced Cataloging and Classification. 4 credits

Prerequisite: LY 425. Principles of cataloging and classification with the L. C. system and subject headings illustrating practices in research and large public libraries. Includes historical survey, non-book materials and current trends.

LY 630—Individual Work. 3 to 5 credits

Prerequisite: Consent of the department chairman. Supplements other graduate courses by providing directed reading and research in special areas of library science; primarily library books and journals.

# MATHEMATICS

## GRADUATE FACULTY 1966-67

Maxfield, J. E., *Chairman;* Bacon, P.; Bastida, J. R.; Bednarek, A. R.; Blake, R. G.; Clark, W. E.; Cohen, E.; Elliott, J. E.; Gager, W. A.; Grillet, P. A.; Hadlock, E. H.; Hutcherson, W. R.; Janos, L.; Jensen, G. A.; Kurtzman, D. R.; Lee, Y. L.; Moore, J. T.; Moore, T. O.; Morse, W. P.; Muwafi, A.; Pirenian, Z. M.; Pop-Stojanovic, Z. R.; Selfridge, R. G.; Smith, C. B.; Smith, F. A.; Smithson, R. E.; Wallace, A. D.; Yee, K. S.; Zeman, J. J.

In addition to the requirements of the Graduate School, the minimum prerequisite for admission to the program of graduate studies in mathematics is the completion with an average grade of B or better of at least 36 credits of undergraduate mathematics, including a full year of calculus and three quarters of appropriate work beyond the calculus. Students lacking part of the requirements will be required to make up the deficiency early in their graduate work.

*Prerequisites* to individual courses should be determined before registration by consultation with the instructor concerned through the departmental office.

Some of the courses listed are offered regularly, while others are offered only as needed. Since times for offering courses are estimated a year in advance, certain changes may be made if needs are known to the department. For the complete listing of graduate courses for a given quarter see the *Schedule of Courses.*

The courses MS 631, MS 632, MS 633, MS 641, MS 642, MS 643, MS 651, MS 652, MS 653, MS 661, MS 662, MS 663 and MS 671 are required in all

doctoral programs, the latter for nine quarters or until graduation, whichever occurs first.

Advanced mathematics courses are not necessarily numbered according to their difficulty. The 700 courses are those related more specifically to some particular field.

Every graduate student is expected to attend an appropriate seminar and the regular colloquium.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MS 501—Intermediate Differential Equations for Engineers and Physical Scientists. 3 credits

MS 502—Vector Analysis. 3 credits

MS 503—Introduction to Complex Variables for Engineers and Physical Scientists 1. 3 credits

MS 504—Introduction to Complex Variables for Engineers and Physical Scientists 2. 3 credits

MS 505—Introduction to Partial Differential Equations. 3 credits

MS 535—Finite Dimensional Vector Spaces 1. 3 credits

MS 536—Finite Dimensional Vector Spaces 2. 2 credits

MS 541—Modern Analysis 1. 3 credits

MS 542—Modern Analysis 2. 3 credits

MS 543—Modern Analysis 3. 3 credits

MS 544—Theory of Differential Equations 1. 3 credits

MS 545—Theory of Differential Equations 2. 3 credits

MS 551—Proseminar 1. 2 credits

MS 552—Proseminar 2. 2 credits

MS 553—Proseminar 3. 2 credits

MS 555—Introduction to Analytic Functions 1. 3 credits

MS 556—Introduction to Analytic Functions 2. 3 credits

MS 561—Introduction to Topology 1. 3 credits

MS 562—Introduction to Topology 2. 3 credits

## GRADUATE COURSES

MS 601—Real and Complex Variables for Engineers and Physical Scientists 1. 3 credits

The first part of a three-term course in real and complex variables, with emphasis on techniques useful in engineering and physical science.

MS 602—Real and Complex Variables for Engineers and Physical Scientists 2. 3 credits

Prerequisite: MS 601. A continuation of MS 601.

MS 603—Real and Complex Variables for Engineers and Physical Scientists 3. 3 credits

Prerequisite: MS 602. A continuation of MS 602.

MS 604—Integral Transforms for Engineers and Physical Scientists. 3 credits

Prerequisites: MS 501, MS 504. Distributions, Fourier and Laplace transforms, other integral transforms, applications.

MS 605—Linear Integral Equations for Engineers and Physical Scientists. 3 credits

Prerequisites: MS 501, MS 504. Linear operators on Hilbert spaces, homo-

geneous Fredholm integral equations, nonhomogeneous Fredholm equations, Volteria integral equations, approximation methods.

MS 606—Introduction to Nonlinear Equations for Engineers and Physical Scientists. 3 credits

Prerequisite: MS 605. Algebraic and transcendental equations, nonlinear differential equations, nonlinear integral equations.

MS 607—Fourier Series 1. 3 credits

The first part of a two-term sequence. Fundamental theorems on convergence, differentiation and integration. Applications to boundary value problems.

MS 608—Fourier Series 2. 3 credits

Prerequisite: MS 607. A continuation of MS 607.

MS 609—Introduction to Calculus of Variations for Engineers and Physical Scientists. 3 credits

Prerequisite: MS 501. Extremals for integrals with fixed endpoints, effect of varying endpoints, transversality condition, direct methods.

MS 610—Tensor Analysis. 3 credits

The calculus of tensors with special attention to its application to differential geometry, problems from physics and n-dimensional spaces.

MS 611—Applications of Group Theory in the Physical Sciences. 3 credits

Prerequisite: PS 644 or CY 655. Group theory, the theory of representations of groups and their relationship to the problems of physics.

MS 614—Numerical Analysis. 3 credits

Prerequisites: MS 411, MS 543 or MS 446. Designed to acquaint research students with numerical analysis, error analysis of differential equations, integral equations, eigen-value and matrix problems with study of errors.

MS 631—Algebra 1. 3 credits

Prerequisites: MS 433, MS 536. An introduction to the theory of finite-dimensional associative algebras, culminating with Wedderburn's structure theorems and Frobenius' theorem on real division algebras. Elementary field theory up to the fundamental theorem of Galois theory. An introduction to universal algebras. The basic homomorphism and isomorphism theorems for groups with multi-operators. Complete and discrete direct sums. An introduction to lattice theory including the Ore-Schmidt theorem for modular lattices. The fundamental theorem of finitely generated abelian groups.

MS 632—Algebra 2. 3 credits

Prerequisite: MS 631. A continuation of MS 631.

MS 633—Algebra 3. 3 credits

Prerequisite: MS 632. A continuation of MS 632.

MS 635—Projective Geometry. 3 credits

Projective planes, perspectivity and projectivity. Fundamental theorem, quadrangles, duality, cross ratio, polarities. Some famous theorems such as those of Pappus, Pascal, Branchon, etc.

MS 636—Non-Euclidean Geometry. 3 credits

Geometric foundation of Euclidean (and non-Euclidean) plane. Plane geometry, trigonometry and calculus of non-Euclidean hyperbolic plane.

MS 637—Higher Geometry. 3 credits

Homogeneous point and line coordinates, projective coordinates, collineations and correlations. Double points, circular points at infinity, conics and involutions. Classification of geometries such as projective, affine, Euclidean, non-Euclidean, metric, finite, etc.

MS 638—Differential Geometry 1. 3 credits
Prerequisites: MS 536, MS 643. Corequisite: MS 661. The first part of a three-term sequence. Classical differential geometry of curves and surfaces, differentiable manifolds, tensor analysis, affine connection, Riemannian geometry, spaces of constant curvature, metric geometry, Lie groups, symmetric spaces, fiber bundles, curves and surfaces in the large.

MS 639—Differential Geometry 2. 3 credits
Prerequisites: MS 635, MS 638. Corequisite: MS 662. Continuation of MS 638.

MS 640—Differential Geometry 3. 3 credits
Prerequisite: MS 639. Corequisite: MS 663. Continuation of MS 639.

MS 641—General Theory of Measure and Integration 1. 3 credits
Prerequisite: MS 543. Measure and outer measures; extension, completion and approximation of the measures; measurable functions; integration; signed measures; product spaces; approximate differentiation and differentials; applications; integration over locally compact spaces and locally compact groups.

MS 642—General Theory of Measure and Integration 2. 3 credits
Prerequisite: MS 641. Continuation of MS 641.

MS 643—General Theory of Measure and Integration 3. 3 credits
Prerequisite: MS 642. Continuation of MS 642.

MS 651—Complex Analysis 1. 3 credits
Prerequisite: MS 643. Rapid survey of properties of complex numbers, linear transformations, geometric forms and necessary concepts from topology. Complex integration, Cauchy's theorem and its corollaries, Taylor's series and the implicit function theorem in complex form. Conformality and the Riemann-Caratheodory mapping theorem. The theorems of Bloch, Schottky and the big and little theorems of Picard. Harmonicity and Dirichlet's problem.

MS 652—Complex Analysis 2. 3 credits
Prerequisite: MS 651. Continuation of MS 651.

MS 653—Complex Analysis 3. 3 credits
Prerequisite: MS 652. Continuation of MS 652.

MS 661—Unified Topology 1. 3 credits
Prerequisites: MS 433, MS 552. A rapid survey of basic concepts in set-theoretic topology including compactness, connectivity, separation properties, and their preservation under continuous functions and Cartesian multiplication. Construction of proofs of cohomology groups, their basic properties expressed via the postulates of Eilenberg-Steenrod, and applications of Euclidean forms.

MS 662—Unified Topology 2. 3 credits
Prerequisite: MS 661. Continuation of MS 661.

MS 663—Unified Topology 3. 3 credits
Prerequisite: MS 662. Continuation of MS 662.

MS 671—The Journal Seminar. 1 credit
Prerequisite: MS 553. Reports on current periodical literature. May be repeated.

MS 675—Individual Work. 3 credits
May be repeated with change of content up to a maximum of 12 credits.

MS 676—Individual Work. 1 credit
May be repeated.

MS 690—Special Topics in Mathematics. 3 credits
Prerequisite: Permission of the graduate adviser, who should be consulted well in advance of registration. Topics previously offered include topological algebra, analytic number theory, relation theory, topological semigroups, differential topology, random functions and random fields, algebraic semigroups, functional analysis.

MS 699—Master's Research. 0 to 9 credits. Maximum 24 credits

MS 745—Theory of Numbers 1. 3 credits

Prerequisites: Two of MS 633, MS 643, MS 653, MS 663. Introduction to the theory of numbers; theorems on divisibility; congruences, number-theoretic functions; primitive roots and indices; the quadratic reciprocity law; Diophantine equations and continued fractions.

MS 746—Theory of Numbers 2. 3 credits

Prerequisite: MS 745. Continuation of MS 745.

MS 747—Theory of Numbers 3. 3 credits

Prerequisite: MS 746. Continuation of MS 746.

MS 755—Algebraic and Functional Analysis 1. 3 credits

Prerequisites: MS 633, MS 643. An algebraic and topological approach to material and methods current in analysis. May be repeated once.

MS 756—Algebraic and Functional Analysis 2. 3 credits

Prerequisite: MS 755. Continuation of MS 755. May be repeated once.

MS 757—Algebraic and Functional Analysis 3. 3 credits

Prerequisite: MS 756. Continuation of MS 756. May be repeated once.

MS 765—Advanced Topics in Algebra 1. 3 credits

Prerequisites: MS 633 and at least one of MS 643, MS 653, MS 663. Investigation of current topics in algebra. May be repeated once.

MS 766—Advanced Topics in Algebra 2. 3 credits

Prerequisite: MS 765. Continuation of MS 765. May be repeated once.

MS 767—Advanced Topics in Algebra 3. 3 credits

Prerequisite: MS 766. Continuation of MS 766. May be repeated once.

MS 781—Mathematical Theory of Elasticity 1. 3 credits

Prerequisite: MS 653 or consent of instructor. Analysis of strain; analysis of stress; solution of two- and three-dimensional elastic problems.

MS 782—Mathematical Theory of Elasticity 2. 3 credits

Prerequisite: MS 781. Continuation of MS 781.

MS 783—Mathematical Theory of Elasticity 3. 3 credits

Prerequisite: MS 782. Continuation of MS 782.

MS 799—Doctoral Research. 1 to 12 credits

# PHILOSOPHY

## GRADUATE FACULTY 1966-67

Hanna, T. L., *Chairman;* Bartlett, G. R.; Clive, G.; Kurtzman, D. R.; Megill, K. A.; Morris, C. W.; Zeman, J. J.; Zweig, M. B.

Students planning work in philosophy leading to the master's degree are advised to consult the chairman of the department at their earliest opportunity.

*Prerequisites:* Adequate undergraduate preparation in philosophy. The consent of the chairman of the department is required before students will be enrolled in any graduate course.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

PPY 500—Advanced Symbolic Logic. 4 credits

PPY 509—Special Topics. 3 to 5 credits

PPY 510—Kant. 4 credits

PPY 511—Philosophy in America. 3 credits

PPY 512—The Pragmatic Movement. 3 credits
PPY 515—Plato. 4 credits
PPY 516—Aristotle. 4 credits
PPY 520—Semantics. 4 credits
PPY 521—Theory of Value. 5 credits
PPY 530—Philosophy of Mathematics. 3 credits
PPY 533—Studies in the Philosophy of Science. 3 credits

### GRADUATE COURSES

PPY 601—Seminar in History of Philosophy. 5 credits
PPY 602—Seminar in Problems of Value. 3 credits
PPY 603—Seminar in Contemporary Philosophy. 5 credits
PPY 604—Seminar in Problems of Knowledge. 3 credits
PPY 605—Seminar in General Theory of Signs. 3 credits
PPY 606—Seminar in Aesthetics. 3 credits
PPY 609—Special Topics. 3 to 5 credits
PPY 610—Mathematical Logic. 5 credits
PPY 615—Seminar in the Philosophy of Mind. 5 credits
PPY 632—Comparative Set Theory. 4 credits
PPY 633—Consistency Proofs in Set Theory. 4 credits
PPY 635—Computability and Solvability. 3 credits
PPY 636—Logical Systems 1. 4 credits
PPY 637—Logical Systems 2. 4 credits
PPY 638—Logical Empiricism. 4 credits
PPY 639—Philosophy of Logic. 4 credits
PPY 640—Seminar in Metaphysics. 4 credits
PPY 656—Special Studies in Ethical Theories. 5 credits
PPY 660—Seminar in Social-Political Philosophy. 4 credits
PPY 663—Seminar: Marx. 4 credits
PPY 690—Individual Work. 3 to 5 credits
PPY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

## PHYSICS

### GRADUATE FACULTY 1966–67

Ballard, S. S., *Chairman*; Adams, E. D.; Bailey, T. L.; Blue, R. A.; Broyles, A. A.; Carr, T. D.; Chen, K-Y.; Chern, B.; Conklin, J. B., Jr.; Dunnam, F. E.; Flowers, J. W.; Green, A. E. S.; Hooper, C. F., Jr.; Knowles, H. L.; Kronsbein, J.; Löwdin, P. O.; Muga, M. L.; Omer, G. C.; Scott, T. A.; Slater, J. C.; Smith, A. G.; Swanson, D. C.; Thomas, B. S.; Williams, D. T.

An undergraduate major in physics, or its equivalent, is prerequisite to undertaking a graduate degree program in physics.

A reading knowledge of German, French, or Russian is required of the candidate for the Master of Science degree.

In general a student will be expected to complete the work for the Master of Science degree before continuing work for the Doctor of Philosophy. A reading knowledge of two of the three languages named above is required of the candidate for the degree of Doctor of Philosophy.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

PS 500—Intermediate Dynamics. 3 credits
PS 510—Electric and Magnetic Fields. 3 credits
PS 515—Electronics 1. 3 credits
PS 516—Electronics 2. 3 credits
PS 520—Fundamentals of Stastistical Physics 2. 3 credits
PS 530—Physical Optics. 3 credits
PS 540—Quantum Theory of Matter 1. 3 credits
PS 545—Atomic and Modern Physics Laboratory. 1 credit
PS 550—Introductory Solid State Physics. 3 credits
PS 560—Nuclear Physics. 3 credits
PS 565—Laboratory Techniques in Nuclear Physics 1. 1 credit
PS 566—Laboratory Techniques in Nuclear Physics 2. 1 credit

## GRADUATE COURSES

PS 601—Classical Mechanics 1. 3 credits
Review of vectors, tensors and matrices; dynamics of particles, special relativity.

PS 602—Classical Mechanics 2. 3 credits
Systems of particles, Lagrange and Hamiltonian mechanics, Hamilton-Jacobi equation, canonical transformations, action angle variables.

PS 605—Special Relativity. 3 credits
Introduction to Einstein's theory of special relativity, employing tensor analysis. general invariance and the background of the general theory of relativity.

PS 606—General Relativity. 2 credits
Introduction to Einstein's general theory of relativity and to relativistic cosmology.

PS 611—Electromagnetic Theory 1. 3 credits
Electrostatics, magnetostatics and Maxwell's equations.

PS 612—Electromagnetic Theory 2. 3 credits
Prerequisite: PS 611. Diffraction, radiation theory, covariant formulation of electromagnetic theory.

PS 621—Statistical Mechanics. 3 credits
Prerequisites: PS 602, PS 645. B-B-G-K-Y hierarchy, Boltzmann equation, Euler's equations, ensemble theory, imperfect gases, density matrix, Slater sum, ideal quantum gases.

PS 629—Chemical Physics. 3 credits
Interatomic and intermolecular forces. Binding energy, optical, electrical and magnetic properties of crystals.

PS 636—Physics of Planetary Atmospheres 1. 3 credits
Identical with ATY 636. Prerequisites: Basic physics and mathematics courses through integral calculus. Planetary aeronomy; Newtonian dynamics; solar system, atomic and quantum theory; solar-terrestial relations; plasmas in space.

PS 637—Physics of Planetary Atmospheres 2. 3 credits
Identical with ATY 637. Prerequisite: PS 636. Fundamental background for advanced topics; quantum mechanics and the central field problem; atomic spectroscopy, molecular energy levels and spectra; radiative transfer in planetary and stellar atmospheres.

PS 638—Physics of Planetary Atmospheres 3. 3 credits
Identical with ATY 638. Prerequisite: PS 637. Advanced topics; space spectroscopy; the infrared; the ultraviolet through x-ray region; the radio region; new instruments, magnetometers, masers, lasers, re-entry and other field applications.

PS 642—Theory of Optical Spectra. 3 credits
Prerequisite: PS 540. Optical spectra of atoms, with emphasis on interpretation of these spectra in terms of atomic structure. Brief introduction to the theory of molecular spectra.

PS 643—Quantum Mechanics 1. 3 credits
Prerequisites: MS 501, MS 502, PS 540, or consent of instructor. The Schrödinger equation. WKB approximation, properties of operators and eigenfunctions, matrices, angular momentum, hydrogen atom.

PS 644—Quantum Mechanics 2. 3 credits
Prerequisite: PS 643. Variational principle, elementary perturbation theory, degenerate perturbation theory. Dirac notation and spin. Quantum theory of measurement.

PS 645—Quantum Mechanics 3. 3 credits
Prerequisite: PS 644. Scattering theory, identical particles, quantized amplitudes, positron hole theory, addition of angular momentum, symmetry principles. Topics may be shifted among PS 643, PS 644 and PS 645.

PS 646—Quantum Theory of Matter 2. 3 credits
Identical with CY 646. Prerequisite: PS 540. Angular momentum, the determinantal method, Hartree-Fock equations. The helium atom, hydrogen molecule and general method of molecular orbitals.

PS 652—Quantum Theory of Matter 3. 3 credits
Identical with CY 652. Prerequisite: PS 646. Group theory and the symmetry of wave functions, polyatomic molecules and energy bands in crystals.

PS 660—Seminar in Experimental Nuclear Physics. 1 credit
Discussions of recent and current literature of nuclear-structure physics from an experimental viewpoint. May be repeated with change of content up to a maximum of 20 credits.

PS 661—Theoretical Foundations of Nuclear Physics. 3 credits
Prerequisite: PS 540. Static properties of nuclei, descriptive aspects of radioactivity and nuclear reactions, systematics of nuclear energies, nuclear models, nuclear decay, nuclear reactions, nuclear forces.

PS 662—Experimental Foundations of Nuclear Physics 1. 3 credits
Prerequisite: PS 661. Radioactivity, radiation detection, nuclear decay, accelerators, basic nuclear reaction studies. Nuclear spectroscopy.

PS 663—Experimental Foundations of Nuclear Physics 2. 3 credits
Prerequisite: PS 662. Nuclear structure, with emphasis on information obtained through nuclear reactions. Application of experimental results to various nuclear models. Scattering.

PS 671—Quantum Electrodynamics 1. 3 credits
Prerequisite: PS 645. The inhomogeneous Lorentz group. One-particle relativistic wave equations for spins 0, ½, and 1 and their Green's functions (Feynman propagators). Photon-electron interaction and Feynman diagrams. Atomic spectral lines and first-order calculation of photon-electron cross sections.

PS 672—Quantum Electrodynamics 2. 3 credits
Prerequisite: PS 671. Renormalization and higher-order corrections to the Compton effect, bremsstrahlung, atomic line widths. Broadening of spectral lines by other particles. Creation and annihilation operators.

PS 680—Seminar in Modern Physics. 1 credit
Recent developments in theoretical and experimental physics. May be repeated with change of content up to a maximum of 20 credits.

PS 681—Computer Methods in Physics. 3 credits
Prerequisite: PS 540. Fortran language and numerical techniques useful in theoretical physics. Includes use of computer.

PS 682—Low-Temperature Physics. 3 credits
Prerequisites: PS 644, PS 652. Introduction to techniques and problems of low-temperature physics; production and measurement of low temperatures; properties of liquid helium, superconductivity, paramagnetism, magnetic cooling, thermodynamic aspects.

PS 690—Individual Work. 3 credits
Assigned reading program or development of an assigned experimental problem. Work selected to meet needs and interests of the student. May be repeated with change of content up to a maximum of 18 credits.

PS 694—Research Techniques. 3 credits
Theory and practice of techniques most frequently required in experimental research. Includes drawing and fabrication of apparatus, glassblowing, vacuum techniques, technical photography, use of reference materials, discussion of current research methods.

PS 699—Master's Research. 0 to 9 credits. Maximum 24 credits

PS 703—Advanced Classical Mechanics. 3 credits
Prerequisite: PS 602. Rigid rotators; elasticity; vibrations, normal modes, waves.

PS 713—Advanced Electromagnetic Theory. 3 credits
Prerequisite: PS 612. Special topics. Content varies, but may include radiation reaction, Lienard-Wiechert potentials, Cerenkov effect, nonlinear optics.

PS 722—Advanced Statistical Mechanics 1. 3 credits
Prerequisite: PS 621. Irreversible processes, many-body problem, Ising model, cluster expansions, phase transitions.

PS 723—Advanced Statistical Mechanics 2. 3 credits
Prerequisite: PS 722. Continuation of PS 722.

PS 741—Atomic and Molecular Collisions 1. 3 credits
Prerequisite: PS 645. Classical and quantum theories of collisions of atoms and molecules, with emphasis on low-energy collisions. Survey of approximate theoretical methods and recent experimental developments.

PS 742—Atomic and Molecular Collisions 2. 3 credits
Prerequisite: PS 741. Continuation of PS 741.

PS 753—Physics of the Solid State 1. 3 credits
Prerequisites: PS 621, PS 652, PS 644. Band theory of solids. The Fermi surface.

PS 754—Physics of the Solid State 2. 3 credits
Prerequisite: PS 753. Transport properties and optical properties of solids.

PS 755—Physics of the Solid State 3. 3 credits
Prerequisite: PS 754. Magnetism.

PS 756—Theory of Atomic and Molecular Structure 1. 3 credits
Identical with CY 756. Prerequisite: PS 646 or PS 643. Mathematical techniques used in atomic, molecular and solid-state theory. The one-electron approximation and the general quantum-mechanical many-body problem. Selected advanced topics.

PS 757—Theory of Atomic and Molecular Structure 2. 3 credits
Identical with CY 757. Prerequisite: PS 756. Continuation of PS 756.

PS 764—Theoretical Nuclear Physics. 3 credits
Prerequisites: PS 644, PS 661. Racah algebra, shell model, electromagnetic properties of nuclei, angular correlation, nuclear reactions, the R maxtrix and dispersion theory, optical model, direct reactions.

PS 765—Theoretical Meson Physics. 3 credits
Prerequisite: PS 764. Strongly interacting particles, meson theory of nuclear forces, phenomenological n-p and p-p scattering, velocity dependent forces, the two-particle Dirac equation and its application to the nucleon-nucleon problem, the nucleon anti-nucleon problem.

PS 766—Theoretical Meson and Nuclear Physics. 3 credits
Prerequisite: PS 765. Advanced topics, the nuclear many-body problem, Hartree-Fock approach, meson-theoretic approach, current topics involving nuclear and meson fields.

PS 771—Quantum Field Theory. 3 credits
Prerequisite: PS 672. Applications of quantized field theory to beta decay, mesons, nucleons and strange particles. High-energy theory.

PS 790—Special Topics. 3 credits
Assigned reading program, seminar, or lecture series in a new field of advanced physics. May be repeated with change of content up to a maximum of 18 credits.

PS 799—Doctoral Research. 1 to 12 credits

# POLITICAL SCIENCE

## GRADUATE FACULTY 1966-67

Dauer, M. J., *Chairman*; Bartley, E. R.; Clubok, A. B.; Farris, C. D.; Hanna, P. L.; Heidenheimer, A. J.; Kammerer, G. M.; Kantor, H.; McQuown, O. R.; Rosenbaum, W. A.; Spanier, J. W.; Svarlien, O.

Students wishing to take work leading to the degrees of Master of Arts and Doctor of Philosophy must have completed an undergraduate major in political science or its equivalent. A student without this undergraduate concentration will take foundation work. As a minimum requirement, half the work for the major for the Master of Arts degree must be at the 600 level, including at least one seminar in each field offered; for the Doctor of Philosophy degree, a larger proportion of 600-level work is required, including seminars in each field offered. The degree of Master of Arts in Teaching is offered.

For the Master of Arts degree the student must offer work in two fields of political science and must also complete a minor in a separate but related discipline. The successful completion of an examination in one foreign language is required. For those candidates for the Master of Arts degree whose major interest is in public administration for government employment and who do not plan to work toward the doctorate, the language requirement may, at the discretion of the supervisory committee and the department, be waived. In the case of such a waiver 6 additional credits of course work will be required.

For the Doctor of Philosophy degree the student will normally pursue a minimum of two years of graduate seminar and course work in preparation for the qualifying written and oral examinations leading to candidacy. A prerequisite to taking these examinations is the successful completion of the language requirement. The qualifying examinations will be in four fields of political science selected by the student with the approval of his graduate supervisory committee from the following: (1) political theory, (2) American government and politics, (3) comparative government, (4) international relations and organization, (5) international law and organization, (6) public law, (7) public

administration and planning. In addition, at the time of the qualifying examinations, the student will be examined in one minor field. Following advancement to candidacy, the third year will be devoted to preparation of the dissertation.

As a part of its graduate program the Department of Political Science offers professional preparation for careers in international affairs, as well as a program in public administration preparing for government service and for university teaching and research in public administration.

For special degree programs in international relations and in Latin American studies, see section entitled *Special Programs.*

Attendance by each graduate student majoring in political science is required at the monthly hour and a half departmental colloquium. At this colloquium there will be discussion of papers written by staff and by graduate students. No more than three of the 500-level courses may be taken for graduate major credit; however, students electing PCL 530 may acquire 12 credits. Additional work in these courses is required of graduate students.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

PCL 507—British Political Model in the Commonwealth. 4 credits
PCL 508—Modes of Politics in Western Europe. 4 credits
PCL 509—American Foreign Policy. 4 credits
PCL 510—Government of Soviet Union. 4 credits
PCL 512—Urban, Suburban and Metropolitan Government. 4 credits
PCL 514—Problems of Administration and Policy. 4 credits
PCL 517—Legislation 4 credits
PCL 520—Political Parties. 4 credits
PCL 521—The Presidency. 4 credits
PCL 522—Government in the Far East. 4 credits
PCL 524—Advanced International Relations. 4 credits
PCL 526—Government and Politics of the Developing Countries. 4 credits
PCL 527—International Organization and Administration: Policies and Functions. 4 credits
PCL 528—African Governments and Politics. 4 credits
PCL 530—Individual Work. 4 credits
PCL 540—International Relations of the American Republics. 4 credits
PCL 541—Government and Politics of South America. 4 credits
PCL 542—Government and Politics of the Cabibbean Countries. 4 credits
PCL 543—Government and Politics of Brazil. 4 credits
PCL 547—National Security and Defense Policy. 4 credits
PCL 591—Masterpieces in the Social Sciences 1. 3 credits
PCL 592—Masterpieces in the Social Sciences 2. 3 credits
PCL 593—Masterpieces in the Social Sciences 3. 3 credits

## GRADUATE COURSES

PCL 613—Seminar in Scope and Method. 4 credits
Research methods in political science. Bibliography. Development of political science.
PCL 614—Political Behavior. 4 credits

PCL 615—Survey Research. 4 credits
Identical with SY 648. Prerequisite: STA 320. Methods of survey research in context of field investigation. Formulation of research hypotheses predicted by theory; construction of measuring instruments; collection, analysis of data.

PCL 616—Seminar in Political Theory. 4 credits
Some problems in political theory. Idealism vs. pragmatism. Theories as to the scope of government. Authority vs. individualism.

PCL 617—Seminar in Political Theory. 4 credits
Continuation of PCL 616. Theories of political causation. Theories of absolute government.

PCL 618—Seminar in Political Behavior. 4 credits
Prerequisite: PCL 531. Advanced studies in the problems of political behavior; concepts and semantics of politics and statistical application and analysis.

PCL 619—History of American Political Theory. 4 credits
Background of American theory. Historical treatment from the Mayflower Compact to the contemporary period.

PCL 620—Latin American Political Theory. 4 credits
Prerequisites: A reading knowledge of Spanish and undergraduate work in Latin American government. Writings and theories of the leading Latin American political thinkers from Alberdi, Sarmiento and Marti to contemporary figures.

PCL 622—Seminar in Public Administrative Behavior. 4 credits
The principal approaches to the study of public administration, with emphasis on the units of analysis and contributions of each approach to general understanding of the field.

PCL 623—Seminar in Public Administrative Behavior. 4 credits
The major methodologies used in the approaches covered in PCL 622.

PCL 624—Seminar in Comparative Public Administration. 4 credits
Prerequisites: PCL 622, advanced courses in comparative government. Organization and approaches, especially as determined by varying political, social and economic environmental factors, among bureaucracies in various parts of the world.

PCL 627—Seminar in International Relations and Organization 1. 4 credits
An analytical study of basic forces, problems and developments in international politics and organization.

PCL 628—Seminar in International Relations and Organization 2. 4 credits
Continuation of PCL 627.

PCL 630—Individual Work. 4 credits
Reading or research in areas of political science needed by graduate students. May be repeated with change of content up to a maximum of 16 credits.

PCL 639—Seminar in Public Law 1. 4 credits
Judicial interpretation and enforcement of written constitutions. Separation of powers. The American federal system. Powers of the federal government. Due process and equal protection.

PCL 640—Seminar in Public Law 2. 4 credits
Continuation of PCL 639.

PCL 643—Seminar in International Law 1. 4 credits
Directed study and research in the field of international law, including the law of international organization.

PCL 644—Seminar in International Law 2. 4 credits
Continuation of PCL 643.

PCL 650—SEMINAR IN GOVERNMENT AND THE PLANNING PROCESS. 4 credits
The nature and scope of governmental planning. Case studies of federal, regional, state and local planning agencies. Emphasis on planning as a governmental process.

PCL 652—SEMINAR IN METROPOLITAN PROBLEMS. 4 credits
Utilization of modern social science techniques in the analysis of problems of metropolitan areas, especially political problems of overlapping units of government.

PCL 653—SEMINAR IN PROBLEMS OF AMERICAN FEDERAL GOVERNMENT. 4 credits
Directed research and analysis of selected problems in American federal government and administration.

PCL 654—SEMINAR IN STATE GOVERNMENT AND POLITICS. 4 credits
Graduate seminar in the bibliography, methodology and research topics of American state and local governments.

PCL 655—SEMINAR IN POLITICAL PARTIES. 4 credits
Group politics in one-party and two-party states, machine and non-machine states. Parties as legal agencies and as autonomous ones. Organization of parties, committees, conventions vs. primaries, etc. Comparative treatment of parties of certain foreign states.

PCL 660—SEMINAR IN COMPARATIVE GOVERNMENT 1. 4 credits
The major institutions, functions and problems of representative major foreign political systems. Methodology and bibliography of comparative government and politics.

PCL 662—SEMINAR IN COMPARATIVE GOVERNMENT 2. 4 credits
Continuation of PCL 660.

PCL 664—SEMINAR IN FAR EASTERN GOVERNMENTS AND POLITICS. 4 credits
Prerequisite: PCL 522 or PCL 526. Directed study and research of Chinese and Japanese government and politics.

PCL 666—SEMINAR IN RUSSIAN AND EASTERN EUROPEAN GOVERNMENTS AND POLITICS. 4 credits
Political heritage of the Revolution. Structural features of the Soviet system. Lawmaking and public administration. The Soviet state and the individual.

PCL 668—SEMINAR IN AFRICAN GOVERNMENTS AND POLITICS. 4 credits
Prerequisite: PCL 528 or PCL 526. Directed study and research in African governments and politics.

PCL 670—SEMINAR IN LATIN AMERICAN GOVERNMENT AND POLITICS 1. 4 credits
Directed study and research in Latin American government and politics. A knowledge of Spanish or Portuguese is required. French may be substituted with consent of instructor.

PCL 672—SEMINAR IN LATIN AMERICAN GOVERNMENT AND POLITICS 2. 4 credits
Continuation of PCL 670.

PCL 674—SEMINAR IN BRAZILIAN GOVERNMENT AND POLITICS. 4 credits
Prerequisites: Reading knowledge of Portuguese and graduate standing in Latin American Area Studies, PCL 541. Analysis of Brazilian government and political parties.

PCL 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

PCL 799—DOCTORAL RESEARCH. 1 to 12 credits

# PSYCHOLOGY

## GRADUATE FACULTY 1966-67

WEBB, W. B., *Chairman*; ANDERSON, R. J.; BARGER, B.; BUNNELL, B. N.; COHEN, L. D.; DAVIS, H. C., JR.; DIXON, J. C.; GRATER, H. A., JR.; GUERTIN, W. H.; HOREL, J. A.; HORNE, E. P.; JOURARD, S. M.; KING, F. A.; KING, R. L.; LEVY, C. M., JR.; MCGEE, R. K.; PENNYPACKER, H. S.; PERRY, N.; RETHLINGSHAFER, D.; SATZ, P.; SCHUMACHER, A. S.; SHAW, M. E.; VANDERIET, V. D.; VIERCK, C. J., JR.; WOLKING, W. D.; WRIGHT, J. M.

Undergraduate preparation should include at least one course in experimental psychology and quantitative methods. Desirable background in other areas includes mathematics; biological, physical and social sciences; philosophy; skill in verbal and written communication; and a reading knowledge of at least one foreign language.

The Master of Arts, Master of Science and Master of Arts in Teaching degrees are offered in general psychology. The Doctor of Philosophy degree is offered in the research-teaching areas of experimental (perception, learning, motivation), comparative, physiological and social psychology and in the professional areas of clinical, counseling and school psychology. The training programs in clinical and counseling psychology are APA approved. A number of assistantships, fellowships, and traineeships are administered through the department, including V.A., U.S.P.H.S., and state mental health scholarships.

A predoctoral internship of one year is required for the clinical, counseling and school psychology specializations.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

PSY 501—ADVANCED GENERAL PSYCHOLOGY. 3 credits
PSY 503—ESSENTIALS OF PSYCHOLOGICAL TESTING 1. 3 credits
PSY 504—ESSENTIALS OF PSYCHOLOGICAL TESTING 2. 3 credits
PSY 506—THEORIES IN SOCIAL PSYCHOLOGY. 3 credits
PSY 507—BASIC COMPARATIVE PSYCHOLOGY. 3 credits
PSY 508—LABORATORY TOPICS IN ANIMAL BEHAVIOR. 3 credits
PSY 509—CURRENT THEORIES IN PERSONALITY. 4 credits
PSY 512—INDIVIDUAL AND GROUP DIFFERENCES. 4 credits
PSY 514—HISTORY OF PSYCHOLOGY. 5 credits
PSY 516—BASIC PHYSIOLOGICAL PSYCHOLOGY. 3 credits
PSY 517—LABORATORY TOPICS IN PHYSIOLOGICAL PSYCHOLOGY. 3 credits
PSY 521—HUMAN LEARNING. 3 credits
PSY 525—MOTIVATION. 4 credits
PSY 550—COGNITIVE PROCESSES. 4 credits

## GRADUATE COURSES

PSY 600—PROSEMINAR 1: LITERATURE IN EXPERIMENTAL PSYCHOLOGY. 6 credits

Empirical and theoretical foundations of various areas of experimental psychology. Required of all first-year graduate students.

PSY 601—PROSEMINAR 2: LITERATURE IN EXPERIMENTAL PSYCHOLOGY. 6 credits

Continuation of PSY 600. Required of all first-year graduate students.

PSY 602—PROSEMINAR 3: LITERATURE IN EXPERIMENTAL PSYCHOLOGY. 6 credits
Continuation of PSY 601. Required of all first-year graduate students.

PSY 603—PSYCHOMETRIC METHODS. 3 credits
Prerequisite: STA 320. Recommended for first-year graduate students. Methods and theory of psychological measurements and scaling.

PSY 604—STATISTICAL METHODS IN PSYCHOLOGY: INFERENCE. 3 credits
Prerequisite: STA 320. Application of inference techniques to psychological data. Sampling theory. Nonparametric procedures, chi square. Analysis of variance.

PSY 605—STATISTICAL METHODS IN PSYCHOLOGY: CORRELATION. 3 credits
Prerequisite: STA 320. Application of correlation techniques to psychological data. Linear, nonlinear and other estimates of relationship. Partial and multiple correlation. Regression and prediction. Test reliability and validity. Factor analysis.

PSY 607—ADVANCED COMPARATIVE PSYCHOLOGY 1. 3 credits
Prerequisite: Consent of instructor. Exploration of current research and theory in comparative psychology. May be repeated with change of content up to a maximum of 9 credits.

PSY 608—ADVANCED COMPARATIVE PSYCHOLOGY 2. 3 credits
Prerequisite: Consent of instructor. Continuation of PSY 607. May be repeated with change of content up to a maximum of 9 credits.

PSY 610—SEMINAR IN PSYCHOPATHOLOGY. 4 credits
Prerequisites: PSY 301, PSY 509. Review of recent research on developmental, somatic and cultural factors associated with selected mental disorders. Emphasizes experimental psychopathology.

PSY 613—CHILDREN'S BEHAVIOR DISTURBANCES. 4 credits
Prerequisites: PSY 312, PSY 503, PSY 509. Behavior deviations common to children and adolescents. Emphasizes causative factors, of maladjustments ranging from inferiority feelings, aggression, fears, etc., to the psychoneuroses and psychoses such as childhood schizophrenia; play therapy techniques.

PSY 614—DEVELOPMENT AND APPRAISAL OF VOCATIONAL CHOICE. 4 credits
Prerequisite: PSY 503. Theories of vocational development and methods of appraisal in assessing vocational choice.

PSY 615—SURVEY OF SOCIAL PSYCHOLOGY. 3 credits
Critical survey of the literature of social psychology.

PSY 616—SEMINAR: SOCIAL PSYCHOLOGY. 3 credits
Prerequisite: PSY 602 or PSY 615. Topics in area of social behavior, with emphasis on current theory and research. May be repeated with change of content up to a maximum of 15 credits.

PSY 617—LABORATORY IN SOCIAL PSYCHOLOGY 1. 3 credits
Prerequisites: PSY 301 or PSY 302, PSY 615 or PSY 616. Design and analysis of experiments pertaining to social phenomena, with emphasis upon recent developments in the field.

PSY 618—LABORATORY IN SOCIAL PSYCHOLOGY 2. 3 credits
Prerequisite: PSY 617. Experimental studies in social psychology.

PSY 619—ADVANCED EXPERIMENTAL PSYCHOLOGY 1. 3 credits
Prerequisite: PSY 301 or PSY 302. Experimental studies in psychophysics, including scaling, sensation, perception, attention, association, reaction time.

PSY 620—ADVANCED EXPERIMENTAL PSYCHOLOGY 2. 4 credits
Prerequisite: PSY 301 or PSY 302. Experimental studies in conditioning, learning, retention, thinking and emotions.

PSY 621—SEMINAR: LEARNING. 4 credits
Theoretical and empirical problems that arise from phenomena of learning.

PSY 624—Seminar: Perception. 4 credits
Conditions, mechanisms, forms and functions of perceptual processes.

PSY 626—Seminar: Experimental Design. 4 credits
Prerequisite: PSY 603. Nature and use of the experimental method in psychology. Critical evaluation of selected experiments. Role of quantitative methodology in experimental planning.

PSY 627—Advanced Physiological Psychology 1. 2 credits
Prerequisite: Consent of instructor. Exploration of current research and theory in physiological psychology. May be repeated with change of content up to a maximum of 6 credits.

PSY 628—Advanced Physiological Psychology 2. 2 credits
Prerequisite: Consent of instructor. Continuation of PSY 627. May be repeated with change in content up to a maximum of 6 credits.

PSY 630—Individual Work. 1 to 5 credits
Reading or research in areas of psychology. May be repeated with change of content up to a maximum of 15 credits.

PSY 631—Research Methods in Social Psychology. 3 credits
Prerequisite: PSY 618. Experimental studies in social perception, social influence, attitudes, leadership, interpersonal perception and related social processes. May be repeated with change in content up to a maximum of 15 credits.

PSY 632—Test Construction. 4 credits
Prerequisites: PSY 503, PSY 605. Theory and practice in construction of tests of general aptitude, special aptitude and personality traits. Psychophysical theory and techniques.

PSY 637—Personal Counseling. 4 credits
Prerequisite: Consent of instructor. Exploration of current theories and practices in personal counseling; the role of the counselor and the nature of the counseling relationship.

PSY 641—Personality Assessment 1. 4 credits
Prerequisites or corequisites: PSY 503, PSY 509. Basic procedures in assessing personality structure and dynamics, including diagnostic interview, case history, objective and projective tests.

PSY 642—Personality Assessment 2. 4 credits
Prerequisite: PSY 641. Advanced procedures in assessing personality structure and dynamics, including diagnostic interview, case history, objective and projective tests.

PSY 643—Personality Assessment 3. 4 credits
Prerequisite: PSY 642. Continuation of PSY 642.

PSY 651—Practicum in Professional Psychology. 5 credits
Prerequisites: PSY 637, PSY 643, admission to program in clinical, counseling or school psychology. Supervised training in appropriate work settings relating theoretical understanding of personality to case handling and consultation through a variety of psychological assessment and treatment procedures. Designed as a sequence of 3 quarters paralleling academic course work. Each succeeding registration requires increasing levels of competence and responsibility. Sixteen credits or equivalent demonstrated competence are recommended for admission to internship, PSY 755. May be repeated with change of content up to a maximum of 20 credits.

PSY 661—Seminar: Psychological Problems of Ageing. 3 credits
Problems of later maturity, emphasizing current research in this area.

PSY 669—SEMINAR: MOTIVATION 1. 2 credits
Factors underlying human motivation approached from both physiological and psychological points of view.

PSY 670—SEMINAR: MOTIVATION 2. 2 credits
Continuation of PSY 669.

PSY 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

PSY 714—CONTEMPORARY SYSTEMS IN PSYCHOLOGY. 4 credits
Prerequisite: PSY 514. Differences in theoretical viewpoint which give rise to the emphasis responsible for the delineation of distinct systems in modern psychology. Original work of leading theorists and its impact upon the nature of the science of psychology.

PSY 729—DYNAMICS OF INDIVIDUAL BEHAVIOR. 4 credits
Perceptual or personalistic approaches to understanding of individual behavior and implications of such theory for major problems in human relations.

PSY 734—SEMINAR: CURRENT CLINICAL LITERATURE. 4 credits
Students are required to do extensive reading on selected topics in area of clinical psychology. May be repeated with change of content up to a maximum of 12 credits.

PSY 735—PROBLEMS IN PSYCHOLOGICAL TREATMENT. 4 credits
Prerequisites: PSY 637, PSY 651. Seminar and case discussion of critical issues and incidents in case handling.

PSY 743—PSYCHODIAGNOSTIC APPRAISAL AND ASSESSMENT. 4 credits
Prerequisite: PSY 643. Synthesis of theory and practice of psychodiagnosis. Utilization of personality test batteries and other data oriented toward both individual case study and group assignment.

PSY 755—INTERNSHIP. 5 credits
Prerequisite: PSY 651. Students in applied specializations are placed in approved intern settings. Designed as a sequence of 3 quarters which must include a minimum of 1,500 work hours. Reading assignments and conferences. Required of all doctoral students in clinical, counseling and school psychology.

PSY 799—DOCTORAL RESEARCH. 1 to 12 credits

# SOCIOLOGY

## GRADUATE FACULTY 1966-67

VANDIVER, J. S., *Chairman;* ALBRECHT, R. E.; BAALI, F. A.; BOCK, E. W.; SAUNDERS, J. V. D.; SMITH, T. L.; WEBBER, I. L.

Before he can undertake graduate study in the Department of Sociology, a student must have completed at least 24 credits of undergraduate study in the social sciences, of which at least 12 credits must have been in sociology.

Study toward the degree of Doctor of Philosophy may be undertaken in the following areas: rural and urban sociology, population study and Latin American Institutions.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

SY 503—HISTORY OF SOCIOLOGICAL THOUGHT. 4 credits

SY 504—ADVANCED GENERAL SOCIOLOGY. 4 credits

SY 514—SOCIAL FACTORS IN HEALTH AND ILLNESS. 4 credits

SY 522—SOCIAL STRATIFICATION. 4 credits

SY 524—Social Structure. 4 credits
SY 528—Industrial Sociology. 4 credits
SY 530—Individual Work. 4 credits
SY 532—The American Family. 4 credits
SY 542—Social Research and Investigation. 4 credits
SY 561—Peoples, Cultures and Social Institutions of Spanish America. 4 credits
SY 562—Peoples, Cultures and Social Institutions of Brazil. 4 credits
SY 571—Population and Public Affairs. 4 credits
SY 581—Collective Behavior. 3 credits
SY 582—Social Movements. 3 credits
SY 585—Juvenile Delinquency. 4 credits
SY 586—Criminology and Penology. 5 credits
SY 590—The South Today. 3 credits
SY 591—Masterpieces in the Social Sciences 1. 3 credits
SY 592—Masterpieces in the Social Sciences 2. 3 credits
SY 593—Masterpieces in the Social Sciences 3. 3 credits
SY 599—Special Study in Sociology. 4 credits

## GRADUATE COURSES

SY 605—Seminar: The Development of Social Thought. 3 credits
Prerequisite: SY 504. The development of social thought from the time of classical Greece to the beginning of sociological theory.

SY 606—Seminar: Basic Sociological Theories. 3 credits
Prerequisite: SY 504. The development of sociological theories from the 19th century to the beginning of the modern period, with emphasis on early American sociologists.

SY 607—Seminar: Contemporary Sociological Theories. 3 credits
Prerequisite: SY 504. The theoretical systems of contemporary sociologists; theoretical contributions in various fields of sociology.

SY 615—Comparative Studies of Health Systems in Human Societies. 3 credits
Health and illness as social entities and their implications in the overall social setting of societies in various parts of the world.

SY 616—Hospital and Related Facilities in the Modern Community. 3 credits
Hospital and associated health facilities as social systems in the context of the community and societal complexes. Emphasis on social factors bearing on the therapeutic process.

SY 617—Health Professions in the Modern Community. 3 credits
Study of the medical and paramedical professions in terms of the social aspects of recruitment, training and practice; social organization of medical practice, practitioner-patient relationships and consequences for the therapeutic process.

SY 618—The Sociology of the Aged. 4 credits
Physical, psychological and social characteristics of older people in Western European and American societies.

SY 630—Individual Work. 4 credits
Designed to permit graduate students to do work in subjects not available in currently offered courses.

SY 634—Seminar in the Study of Marriage and the Family. 4 credits

A critical analysis of the classical systematic treatises and of the more significant research studies in the field.

SY 643—SOCIAL RESEARCH METHODS. 5 credits

Advanced studies in the literature of methodology. Emphasis on statistical, sociometric and experimental methods.

SY 648—SURVEY RESEARCH. 4 credits

Identical with PCL 615. Prerequisite: STA 320.

SY 651—SEMINAR IN ADVANCED URBAN SOCIOLOGY 1. 3 credits

Readings, reports and supervised research in the field of urban sociology. Emphasis on techniques of analyzing problems and trends in urban life.

SY 652—SEMINAR IN ADVANCED URBAN SOCIOLOGY 2. 3 credits

Advanced study of selected topics in urban sociology, with emphasis on critical evaluation of current research. Reports and supervised research.

SY 653—SEMINAR IN ADVANCED URBAN SOCIOLOGY 3. 3 credits

Intensive consideration of major theoretical problems in urban sociology. Relationship of conceptualizations to understanding of pathological aspects of city life. Readings and reports.

SY 656—ADVANCED STUDY OF RURAL SOCIETY. 4 credits

The rural life of modern man. Readings and supervised research, with emphasis on rural life in the United States, the Southeast and Florida.

SY 658—SEMINAR: SOCIOLOGY OF RURAL DEVELOPMENT. 4 credits

The processes of development. Analysis of change and stability in the rural setting. Changing patterns of social differentiation and stratification and in the structure and functions of other rural social institutions.

SY 664—SEMINAR IN SPANISH AMERICAN SOCIETIES. 4 credits

Intensive study of the peoples and cultures of Spanish American countries.

SY 665—SEMINAR IN BRAZILIAN SOCIETY. 4 credits

The peoples and institutions of Brazilian life today.

SY 667—SEMINAR ON THE BRAZILIAN COMMUNITY. 4 credits

Prerequisite: SY 562. Intensive study of specific Brazilian community settings.

SY 672—SEMINAR IN POPULATION. 4 credits

Prerequisite: SY 571. Readings, seminar reports and supervised research in population. Emphasis on studies of research techniques and on population trends in the United States.

SY 673—SEMINAR IN LATIN AMERICAN POPULATION. 4 credits

Prerequisites: SY 571, reading knowledge of either Spanish or Portuguese. Readings, seminar reports, and supervised research in Latin American demography. Emphasis on the interrelationship between demographic and other social phenomena.

SY 691—SEMINAR IN AMERICAN MINORITY GROUPS. 4 credits

Prerequisite: SY 391. Readings, reports and supervised research in the field of American minority groups.

SY 694—SEMINAR: SOCIAL STRUCTURE AND CHANGE IN THE ARAB EAST. 4 credits

Sociological analysis of the structure, functions, processes and changes in contemporary societies of the Arab East.

SY 695—SEMINAR IN CONTEMPORARY AFRICAN SOCIETIES. 4 credits

Advanced study of the contemporary peoples and societies of Africa, with emphasis on sub-Saharan Africa and on the social and cultural changes accompanying the end of colonialism.

SY 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

SY 799—DOCTORAL RESEARCH. 1 to 12 credits

# SPEECH

## GRADUATE FACULTY 1966-67

MOORE, G. P., *Chairman*; ABBOTT, T. B.; BORCHARDT, D. A.; BRANDT, J. F.; BZOCH, K. R.; DEW, D.; HALE, L. L.; HOLLIEN, H. F.; JENSEN, P. J.; KARNS, C. F.; KURTZROCK, G. H.; LAZIER, G. N.; MARKEL, N. N.; MASE, D. J.; POLLOCK, K. C.; TEW, R. E.; WILLIAMS, D. E.; ZIMMERMAN, L. L.

Graduate programs in speech lead to Master of Arts and Doctor of Philosophy degrees with major emphasis in either the communication sciences, general speech, rhetoric and public address, speech pathology, audiology or theatre and interpretation. In addition to the requirements of the Graduate School, an adequate undergraduate background in the area of major interest is prerequisite to admission for graduate study. Students with insufficient undergraduate course preparation will be requested to make up deficits.

Assistantships, fellowships, non-Florida fee scholarships and traineeships are available.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

SCH 501—HISTORY OF RHETORICAL THEORY. 5 credits
SCH 505—FORMS OF PUBLIC ADDRESS. 3 credits
SCH 510—GREAT DEBATES IN AMERICAN LIFE, 1650 to 1860. 3 credits
SCH 511—GREAT DEBATES IN AMERICAN LIFE, 1860 to 1920. 3 credits
SCH 512—GREAT DEBATES IN AMERICAN LIFE, 1920 TO PRESENT. 3 credits
SCH 520—HISTORY OF THE THEATRE 1. 3 credits
SCH 521—HISTORY OF THE THEATRE 2. 3 credits
SCH 522—HISTORY OF THE THEATRE 3. 3 credits
SCH 529—STYLES IN THEATRICAL ART 1. 3 credits
SCH 530—STYLES IN THEATRICAL ART 2. 3 credits
SCH 531—STYLES IN THEATRICAL ART 3. 3 credits
SCH 540—PRINCIPLES OF SPEECH PATHOLOGY: ARTICULATION DISORDERS. 4 credits
SCH 541—PRINCIPLES OF SPEECH PATHOLOGY: VOICE DISORDERS. 4 credits
SCH 542—PRINCIPLES OF SPEECH PATHOLOGY: LANGUAGE DISORDERS. 4 credits
SCH 543—PRINCIPLES OF SPEECH PATHOLOGY: STUTTERING. 4 credits
SCH 549—CLINICAL PROCEDURES IN SPEECH PATHOLOGY AND AUDIOLOGY. 4 credits
SCH 560—PRINCIPLES OF AUDIOLOGICAL EVALUATION 1. 4 credits
SCH 561—PRINCIPLES OF AUDIOLOGICAL EVALUATION 2. 4 credits
SCH 570—HEARING AIDS AND AUDITORY TRAINING. 4 credits
SCH 571—VISUAL COMMUNICATION FOR THE DEAF AND HARD OF HEARING. 4 credits
SCH 572—SPEECH AND LANGUAGE FOR THE DEAF AND HARD OF HEARING. 4 credits
SCH 580—LABORATORY INSTRUMENTATION. 5 credits
SCH 585—ADVANCED PHONETICS AND PHONEMICS. 5 credits
SCH 590—NEUROPHYSIOLOGY OF HEARING. 5 credits

## GRADUATE COURSES

SCH 600—Introduction to Graduate Study. 3 credits
Required of all graduate students majoring in speech who do not take SCH 680, SCH 681 and SCH 682. The various areas of the field of speech, with a review of the literature.

SCH 601—Seminar in Ancient and Medieval Rhetoric. 5 credits
Selected works of outstanding classical writers who have influenced rhetorical thought, criticism, speaking and writing.

SCH 602—Seminar in Renaissance and Modern Rhetoric. 5 credits
Emphasizes the rhetorical theory of Continental, English and American writings, 1200 to 1900.

SCH 603—Seminar in Contemporary Rhetoric. 5 credits
Major trends in contemporary rhetorical thought, with reference to their sources and pedagogical implications.

SCH 605—Rhetorical Criticism. 5 credits
Principles and methods of rhetorical criticism; problems in applying critical standards in the evaluation of public address.

SCH 608—Seminar in American Public Address. 5 credits
Selected speeches, speakers, and speaking movements which have had an impact on our history.

SCH 609—Seminar in British Public Address. 5 credits
Selected speakers prominent in British history.

SCH 610—Seminar in Southern Public Address. 5 credits
Analysis and evaluation of selected Southern speakers in terms of the speakers, the speeches, the audiences and the times.

SCH 620—Advanced Problems of Stage Direction. 5 credits
Application of production theories to the problems of play direction, and a supervised problem in advanced directing techniques.

SCH 621—Advanced Problems in Scene Design. 5 credits
Application of production theories to the problems of scene design, and a supervised problem in advanced scene design.

SCH 622—American Plays, Players and Playwrights 1. 3 credits
Plays and their production from the Colonial Period to 1860; techniques of outstanding actors and playwrights.

SCH 623—American Plays, Players and Playwrights 2. 3 credits
American plays and players from 1860 to present.

SCH 627—Art History of the Theatre. 3 credits
Seminar in changing physical and visual conventions in the theatre, their origins in the visual traditions of the culture and their effect on the modes of dramatic presentation. May be repeated with change of content up to a maximum of 6 credits.

SCH 628—Seminar in Theatre Aesthetics 1. 3 credits
The growth of the theatre as an art in periods through the Renaissance; the theatre's relation to the aesthetic values of the cultures involved.

SCH 629—Seminar in Theatre Aesthetics 2. 3 credits
Development and modification of aesthetic theory from the Renaissance to the present.

SCH 630—Individual Study. 1 to 10 credits
Available by permission of major professor and department chairman. A project or research course in areas of speech needed by graduate students. May be repeated with change of content up to a maximum of 10 credits.

SCH 637—Research in Regional Theatre. 3 credits
The development and forms of past and present regional theatres. Emphasizes Southern and Florida theatre history.

SCH 638—Speech Research (Theatre). 3 credits
Prerequisite: Permission of the department chairman. A lecture and project course in the more complex problems in speech (theatre).

SCH 639—Theories of Interpretative Reading. 3 credits
The psychological and philosophical theories of creative, artistic oral reading; the teaching of interpretative reading; practice in reading from the works of selected modern authors.

SCH 640—Seminar in Speech Pathology: Articulation Disorders. 4 credits
Prerequisite: SCH 540. Theory and research in articulation disorders.

SCH 641—Seminar in Speech Pathology: Voice Disorders. 4 credits
Prerequisite: SCH 541. Theory and research in voice disorders.

SCH 642—Seminar in Speech Pathology: Language Disorders. 4 credits
Prerequisite: SCH 542. Theory and research in language disorders.

SCH 643—Seminar in Speech Pathology: Stuttering. 4 credits
Prerequisite: SCH 543 or consent of instructor. Theoretical and experimental literature concerning stuttering and related problems.

SCH 649—Clinical Practice in Speech Pathology: Diagnosis. 1 to 10 credits
Prerequisite: SCH 549 or consent of instructor. May be repeated with change of content up to a maximum of 10 credits.

SCH 654—Seminar in Speech Pathology and Audiology: Mental Retardation. 4 credits
Prerequisite: Consent of instructor. Theory and research in communication problems associated with mental retardation.

SCH 655—Seminar in Speech Pathology and Audiology: Cerebral Palsy. 4 credits
Prerequisite: Consent of instructor. Theory and research in communication problems associated with cerebral palsy.

SCH 656—Seminar in Speech Pathology and Audiology: Aphasia. 4 credits
Prerequisite: Consent of instructor. Theory and research in aphasia.

SCH 657—Seminar in Speech Pathology and Audiology: Cleft Palate. 4 credits
Prerequisite: Consent of instructor. Evaluation of the theoretical and experimental literature pertaining to speech habilitation and rehabilitation of persons with cleft palate conditions.

SCH 659—Clinical Practice in Speech Pathology: Therapy. 1 to 15 credits
Prerequisite: Consent of instructor. Supervised clinical practice in speech therapy. May be repeated with change of content up to a maximum of 15 credits.

SCH 660—Seminar in Audiology: Diagnostic Procedures. 4 credits
Prerequisite: SCH 561 or consent of instructor. Theory and research in differential audiometry and special diagnostic problems.

SCH 669—Clinical Practice in Hearing Measurement. 1 to 10 credits
Prerequisite: SCH 561. Supervised clinical practice in hearing measurement. May be repeated with change of content up to a maximum of 10 credits.

SCH 670—SEMINAR IN AUDIOLOGY: AURAL REHABILITATION. 4 credits
Prerequisite: Consent of instructor. Evaluation of the theoretical and experimental literature of selected problems.

SCH 671—SEMINAR IN AUDIOLOGY: PROBLEMS OF THE DEAF AND HARD OF HEARING. 4 credits
Prerequisite: Consent of instructor. Evaluation of the theoretical and experimental literature pertaining to language and speech of persons with severe and profound hearing loss.

SCH 679—CLINICAL PRACTICE IN AURAL REHABILITATION. 1 to 10 credits
Prerequisite: Consent of instructor. Supervised clinical practice in aural rehabilitation. May be repeated with change of content up to a maximum of 10 credits.

SCH 680—PRO-SEMINAR IN COMMUNICATION SCIENCES 1. 3 credits
Scientific and theoretical bases of the communication sciences. Experimental phonetics, audition, psycholinguistics, experimental linguistics and communication factors engineering. Required of all beginning students majoring in any communication sciences emphasis area.

SCH 681—PRO-SEMINAR IN COMMUNICATION SCIENCES 2. 3 credits
Prerequisite: SCH 680. Continuation of SCH 680. Required of beginning students majoring in communication sciences.

SCH 682—PRO-SEMINAR IN COMMUNICATION SCIENCES 3. 3 credits
Prerequisite: SCH 681. Continuation of SCH 681. Required of beginning students majoring in communication sciences.

SCH 685—EXPERIMENTAL PHONETICS 1. 3 credits
Prerequisite: Consent of instructor. Principles involved in acoustical and physiological analyses of voice production and laryngeal function. Includes major theories, experimental procedures and research findings.

SCH 686—EXPERIMENTAL PHONETICS LAB 1. 3 credits
Prerequisite: SCH 685. Laboratory experience in experimental methods and techniques for the study of voice production and analysis of voice signals. Students required to design and carry out an experiment in this area.

SCH 687—EXPERIMENTAL PHONETICS 2. 3 credits
Prerequisite: SCH 580. Principles of scientific analysis of speech production and recognition; major theories, experimental procedures and research findings.

SCH 688—EXPERIMENTAL PHONETICS LAB 2. 3 credits
Prerequisite: SCH 687. Laboratory experience in the major experimental methodologies and techniques in speech articulation, resonation and function. Each student required to design and carry out a pilot study in this area.

SCH 690—PSYCHOACOUSTICS. 5 credits
Prerequisite: SCH 490 or consent of instructor. Lectures and discussions on advanced topics and current research in auditory sensation and perception.

SCH 691—PSYCHOACOUSTICS LABORATORY. 3 credits
Prerequisites: SCH 690, consent of instructor. Analysis of stimulus generation equipment. Replication of classical experiments.

SCH 695—PSYCHOLINGUISTICS. 5 credits
Research literature in psycholinguistics. Evaluation of theories, historical factors, geographic distinctions and research procedures related to language development and usage.

SCH 696—PSYCHOLINGUISTICS LABORATORY. 3 credits
Prerequisite: SCH 695. Design and analysis of experiments pertaining to the psychology of language. Emphasis on areas of current research interest.

SCH 697—Experimental Linguisitics. 5 credits
Prerequisites: SCH 580, SCH 585, EH 606. Nature and use of experimental method in linguistics. Evaluation of selected research topics.
SCH 699—Master's Research. 0 to 9 credits. Maximum 24 credits
SCH 772—Seminar in Audiology: Hearing Conservation and Noise Control. 4 credits
Prerequisite: Consent of instructor. Environmental noise: its characteristics; effects on hearing; control; associated topics.
SCH 780—Seminar in Communication Sciences. 3 credits
Advanced research problems in communication sciences.
SCH 785—Seminar in Experimental Phonetics. 3 credits
Advanced research problems in the production of voice or speech.
SCH 786—Seminar in Speech Recognition. 3 credits
Advanced research problems in the analysis and synthesis of speech. Emphasizes vocoders, machine translation and computer processing of speech.
SCH 790—Seminar in Audition. 3 credits
Research problems in psychoacoustics, or acoustic physiology; recent advances in theories of hearing.
SCH 795—Seminar in Psycholinguistics. 3 credits
Theoretical and research problems in psycholinguistic processes of communication.
SCH 796—Seminar in Experimental Linguistics. 3 credits
Selected problems in linguistic theory and research, with emphasis on experimental analysis.
SCH 799—Doctoral Research. 1 to 12 credits

# ZOOLOGY

## GRADUATE FACULTY 1966-67

Wallace, H. K., *Chairman*; Auffenberg, W.; Berner, L.; Brodkorb, P.; Brookbank, J. W.; Carr, A. F.; Chernetski, K. E.; DeWitt, R. M.; Dickinson, J. C., Jr.; Elliott, P. R.; Goin, C. J.; Gregg, J. H.; Hunter, G. W. III; Hussey, R. F.; Johnston, D. W.; Jones, E. R.; Kaufmann, J. H.; Kilby, J. D.; Laessle, A. M.; Leavitt, B. B.; McNab, B. K.; Maturo, F. J. S.; Nation, J. L.; Nordlie, F. G.; Patton, T. H.; Pierce, E. L.; Sauer, E. G. F.; Wallbrunn, H. M.; Webb, S. D.; Westfall, M. J.

The Department of Zoology offers graduate work leading to the degrees of Master of Science in Teaching, Master of Science and Doctor of Philosophy. The teaching of graduate courses and supervision of graduate students is conducted by a Graduate Faculty that includes staff members from the College of Arts and Sciences, the College of Medicine, the College of Agriculture, the University College and the Florida State Museum.

The work of the department is divided into two general areas: comparative biology of the whole organism, and studies at the cellular and molecular level of organization. All candidates for graduate degrees will be required to take, or have a knowledge equivalent to, the following: introductory biology or zoology, ecology, embryology, comparative anatomy or functional morphol-

ogy, invertebrate or vertebrate zoology, genetics, cellular physiology, one year of physics, chemistry through organic, mathematics through introductory calculus, and basic statistics. The remainder of the student's program will be determined by his supervisory committee.

*Undergraduate preparation in zoology:* Prospective graduate students should take as undergraduates as many as possible of the courses listed in the preceding paragraph. These courses constitute a *core curriculum* for all candidates for the M.S.T., M.S., and Ph.D. degrees. Any of the courses not taken as an undergraduate must be made up early in the graduate program without graduate credit.

*Entrance requirements:* The requirements for admission to the graduate program in zoology consist of the following: a 3.0 (B) average in all work attempted during the last two undergraduate years; an average of 500 or better on the Verbal and Quantitative portions of the Graduate Record Examination; and a major in zoology plus a total of 30 credits in chemistry, physics and mathematics or a major in chemistry, physics or mathematics plus 21 credits in zoology. Students with special training or aptitudes may be allowed some variation in prerequisites.

*Examinations:* All graduate students will be given a written examination covering the zoological portion of the core program by the Departmental Examining Committee during or soon after their first term of residence. The results of this examination will be used in planning the student's program. It will be the responsibility of the candidate's supervisory committee to take whatever action is necessary to insure that the nonzoological portion of the core program is satisfactorily completed.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ZY 505—General Ecology. 4 credits
ZY 507—Vertebrate Paleontology. 4 credits
ZY 516—Animal Parasitology. 5 credits
ZY 521—Comparative Histology. 4 credits
ZY 545—Physiological Genetics. 4 credits
ZY 551—Cytology. 5 credits
ZY 570—Cellular Physiology. 4 credits
ZY 571—Techniques in Cellular Physiology. 1 credit
ZY 574—Tissue and Organ Physiology. 5 credits
ZY 575—Introduction to Nervous Systems 1. 2 credits
ZY 576—Introduction to Nervous Systems 2. 2 credits
ZY 577—Neurophysiology Laboratory. 1 credit

## GRADUATE COURSES

ZY 606—Biological Literature. 2 credits
ZY 607—Ancient Vertebrate Faunas. 3 credits
Identical with GY 607. Prerequisite: ZY 507 or GY 507. Evolution, distribution and extinction of vertebrate faunas with emphasis on problems in paleoecology, paleogeography and patterns of phylogeny.
ZY 609—Zoogeography. 3 credits

ZY 612—Marine Ecology. 4 credits
Prerequisites: ZY 308, CY 213 or equivalent. Marine communities and the physical and chemical factors that influence them.

ZY 624—Helminthology. 5 credits
Identical with VY 624. Prerequisite: ZY 516. Physiology, biochemistry, life cycles and morphology of the helminths. Emphasis on the host-parasite relationship and immune responses.

ZY 625—Protozoology. 5 credits
Identical with VY 625.

ZY 626—Community Ecology. 4 credits
Prerequisite: ZY 505. Selected animal habitats, their occupants and organization. Classroom work evaluates community concept and appraises role of ecology in evolution.

ZY 628—Limnology. 4 credits
Prerequisites: ZY 505, BTY 380, CY 213. The biological, chemical and physical dynamics of inland waters.

ZY 629—Seminar in Ecology. 2 credits
Prerequisites: ZY 505, ZY 626. May be repeated with change of content up to a maximum of 6 credits.

ZY 630—Individual Studies in Zoology. 4 credits
Prerequisite: Consent of instructor. Studies may be chosen from the following fields: comparative anatomy, cytology, ecology, embryology, fresh water biology, genetics, herpetology, histology, icthyology, invertebrate zoology, including arachnology and insect biology, limnology, malacology, mammalogy, marine biology, ornithology, parasitology, general or comparative physiology, protozoology, vertebrate paleozoology, animal behavior and zoogeography. May be repeated only with special permission. May not be taken by students on academic probation.

ZY 632—Advanced Invertebrate Zoology. 4 credits
Prerequisite: ZY 308.

ZY 633—Principles of Systematic Zoology. 3 credits
A critical study of selected taxonomic synopses, revisions and monographs; the principles and concepts of distribution, genetics and ecology of taxonomic problems.

ZY 641—Comparative Physiology. 5 credits
Prerequisites: ZY 570, ZY 571. Interpretation of physiological mechanisms of invertebrates in terms of structural variation, ecology and evolutionary history.

ZY 642—Physiological Ecology. 4 credits
Prerequisites: ZY 570, ZY 571. The physiological mechanisms that influence distribution and ecological relations, water conservation, and energy exchange in vertebrates.

ZY 647—Experimental Embryology. 3 credits
Prerequisites: ZY 310, ZY 570, ZY 571. An analysis of the problems of embryonic development, and the experimental approach to their solution.

ZY 648—Experimental Embryology Laboratory. 2 credits
Prerequisite or co-requisite: ZY 647. Modern techniques for the analysis of embryonic development in a wide variety of zoological material.

ZY 649—Special Topics in Embryology. 2 credits
Prerequisites: ZY 647, consent of instructor. A sample, in some depth, of specialized areas in the field of embryonic development. Topics will vary each term. May be repeated with change of content up to a maximum of 6 credits.

ZY 651—Ichthyology. 4 credits
Prerequisite: ZY 307.

ZY 652—Herpetology. 3 credits
Prerequisite: ZY 307.

ZY 653—Mammalogy. 5 credits
Prerequisite: ZY 307.

ZY 654—Ornithology. 4 credits
Prerequisite: ZY 307.

ZY 664—Topics in Genetics. 2 to 4 credits
Identical with AL 664, AY 664, BCY 664, BTY 664, PY 664. See AY 664. May be repeated with change of content up to a maximum of 12 credits.

ZY 666—Biometrics. 3 credits
Prerequisites: STA 320 and 30 credits in biology. Application of standard statistical procedures to biological problems.

ZY 671—Ethology 1. 4 credits
Prerequisites: ZY 505, ZY 575. History, concepts and methods of the comparative study of animal and human behavior. The biological substrate and classification of behavior.

ZY 672—Ethology 2. 4 credits
Prerequisite: ZY 671. The evolution and analysis of behavior systems, social life and societies.

ZY 673—Special Topics in Ethology. 3 credits
Prerequisites: ZY 671 and consent of instructor. An advanced study of special behavioral topics. May be repeated with change of content up to a maximum of 9 credits.

ZY 675—Seminar in Comparative Neurology. 2 credits
Prerequisites: ZY 576, ZY 577. Lower vertebrate and invertebrate nervous systems. May be repeated with change of content up to a maximum of 6 credits.

ZY 690—Special Topics in Zoology. 4 credits
Special topics, studied with small groups of students, include wildlife conservation, fishery biology, cytogenetics, taxonomy, and natural history of arthropods. May be repeated with change of content up to a maximum of 12 credits.

ZY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ZY 799—Doctoral Research. 1 to 12 credits

# SCHOOL OF JOURNALISM AND COMMUNICATIONS

## COMMUNICATIONS

### GRADUATE FACULTY 1966–67

Weimer, R. O., *Director*; Christiansen, K. A.; Griggs, H. H.; Newbill, M. L.

The degree Master of Arts in Journalism and Communications with a major in communications is offered. Specialization may be in radio, television or educational broadcasting.

Admission requirements are a bachelor's degree in broadcasting or some allied field or a foundation in general communications and broadcast writing, production and news. Adequate preparation in the social sciences and humanities is required of each student.

The minor field or fields will be selected in consultation with the major

adviser and will depend on the special needs of the student. A 9-credit minor may be taken only if the student already has a minimum of 18 undergraduate credits within the same minor field. Otherwise an 18-credit minor must be taken.

JM 601—Research Methods in Mass Communications and either JM 605—Seminar in Mass Communications and Society or JM 606—Seminar in Mass Communication Theory are required of all candidates. BR 518—Teaching Through Television will be accepted as major credit in a master's degree program in communications.

### GRADUATE COURSES

COM 603—Broadcast Station Management. 3 credits
Station organization, operational policies, market research, programming policy, network affiliation, federal and state regulations governing the broadcasting industry, FCC procedures.

COM 618—Radio, Television and Film Writing. 5 credits
Forms, techniques and types of writing as they apply to radio, television and film.

COM 623—Radio Programming and Production. 4 credits
A lecture-laboratory course in producing and programming complex program types, with student participation in broadcasting activities.

COM 625—Television Staging and Lighting. 5 credits
Staging and lighting problems, with emphasis on the creative aspects of staging and lighting production.

COM 628—Radio and Television in Education. 4 credits
The role of the broadcast media in public school education and adult education; current usages in direct and indirect teaching and continuing education.

COM 630—Individual Work. 1 to 5 credits
A reading or research course in such areas of broadcasting as are needed by graduate students. May be repeated with change of content up to a maximum of 10 credits.

COM 699—Master's Research. 0 to 9 credits. Maximum 24 credits

## JOURNALISM

### GRADUATE FACULTY 1966-67

Weimer, R. O., *Director*; Griggs, H. H.; Heath, H. E.; Hooper, L. J.; Jones, J. P.; Webb, J. V.

The degree Master of Arts in Journalism and Communications with a major in journalism is offered. Specialization may be in news—editorial, advertising, public relations, journalism education, international communications, communications research, or media management.

Admission requirements are a bachelor's degree in journalism, advertising, or some allied field. The student who does not hold a degree in one of these fields may be required to complete satisfactorily the following undergraduate work: (1) for the news-editorial or public relations student, two courses in reporting and one course each in editing, news photography, history of communications, and law of the press; (2) for the advertising student,

one course each in advertising principles, copy and layout, principles of marketing, radio-TV advertising, advertising campaigns, and retail advertising.

Adequate preparation in the social sciences and humanities is required of each student.

The minor field or fields will be selected in consultation with the major adviser and will depend on the special needs of the student. A 9-credit minor may be taken only if the student already has a minimum of 18 undergraduate credits within the same minor field. Otherwise an 18-credit minor must be taken. JM 601—Research Methods in Mass Communications and either JM 605—Seminar in Mass Communications and Society or JM 606—Seminar in Mass Communication Theory are required of all candidates. ADV 512—Advertising Campaigns will be accepted as major credit in a master's degree program in journalism.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

JM 508—Public Opinion. 5 credits
JM 509—Law of the Press and Radio-TV. 4 credits
JM 515—Journalism in Secondary Schools. 5 credits

## GRADUATE COURSES

JM 601—Research Methods in Mass Communications. 3 credits
Bibliography and documentation, research planning, basic sampling procedures, opinion surveys, content analysis, readership/audience studies, historiography.

JM 602—Advertising Research Problems. 4 credits
Methods of testing advertising appeals and efficiency, market analysis, consumer analysis.

JM 603—Newspaper Production and Management. 5 credits
Newspaper business management, good will, budgets, accounting, labor relations, taxes, legal questions, postal regulations, newspaper promotion, circulation, personnel, advertising problems, weekly and small daily publishing.

JM 605—Seminar in Mass Communications and Society. 4 credits
Rights, responsibilities, ethics of communication media; government and communication media; economic, political and social determinants of the character and content of mass communications; relationship and competition among mass media.

JM 606—Seminar in Mass Communication Theory. 4 credits
Structure, content, process, and effects of communication; contributions of other disciplines to knowledge about the process, e.g., semantics, linguistics, learning theory; barriers to effective communication; use of research concepts and findings.

JM 611—Seminar in History of Communications. 4 credits
Reading, critical study, and advanced investigative report on an approved research subject in the history of mass communications.

JM 614—Problems in Public Relations. 4 credits
Specialized areas in public relations, case studies, community relations, analysis of public relations problems in the light of public relations and other communication theory.

JM 616—Seminar in Journalism Teaching. 4 credits
Research and training for journalism teaching and supervision of student publications.

JM 618—International Communications. 5 credits

Channels of international communication, controls, the foreign correspondent, world news agencies, comparison of mass media in major regions of the world.

JM 620—Investigative Reporting. 5 credits

Analysis of current news problems in correlation with background social science courses; writing investigative, interpretive and editorial articles and columns; depth reporting.

JM 621—Advanced Research Methods. 3 credits

Prerequisites: JM 601, STA 320 or EDF 360. Scientific method, experimental design, statistical measurement and analysis, advanced research methodology in mass communications.

JM 630—Individual Work. 1 to 5 credits

A reading or research course in such areas of journalism as are needed by graduate students. May be repeated with change of content up to a maximum of 10 credits.

JM 699—Master's Research. 0 to 9 credits. Maximum 24 credits

## BIOLOGICAL SCIENCES, DIVISION OF

(Cross College and Cross Department)

COLLEGE OF AGRICULTURE

COLLEGE OF ARTS AND SCIENCES

COLLEGE OF MEDICINE

Appropriate graduate faculty members from the Colleges of Arts and Sciences, Agriculture, and Medicine.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

BLY 560—Radiation Effects and Radiation Biology. 5 credits
BLY 565—Radioisotope Theory and Techinques. 5 credits

## GRADUATE COURSES

BLY 601—Cellular and Molecular Biology. 3 credits
Interdisciplinary course presented by the several departments of the above colleges designed to broadly orient the student in the cellular and molecular aspects of biology.

BLY 660—Radiation Biology. 5 credits
Prerequisites: One year each of college physics, mathematics, and biology or botany; chemistry through organic. General survey of biological effects of radiations, with emphasis on cellular effects and mechanisms.

# COLLEGE OF BUSINESS ADMINISTRATION

GENERAL

ACCOUNTING

ECONOMICS

FINANCE AND INSURANCE

HEALTH AND HOSPITAL ADMINISTRATION

MANAGEMENT AND BUSINESS LAW

MARKETING

REAL ESTATE AND URBAN LAND STUDIES

# BUSINESS ADMINISTRATION—GENERAL

For admission to courses listed below, the student must have been admitted to the Graduate School and normally should have had undergraduate courses in fields pertinent to the graduate courses selected. Where necessary, special arrangements may be made with the approval of the dean.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

BS 591—Mathematical Methods and Their Application to Business and Economic Analysis. 5 credits

## GRADUATE COURSES

BS 610—Managerial Accounting. 4 credits
Prerequisites: ATG 201, ATG 202, ATG 203 or ATG 590. Designed for M.B.A. students. Periodic income measurement; relation of accounting techniques to control of business operations; effects of federal income taxes on management decisions.

BS 664—Managerial Statistics. 4 credits
Utilization of statistical methods in business decision making. Emphasizes statistical inference as an approach to solving business problems.

BS 671—Human Relations in Business. 4 credits
Relationship between the individual business administrator and his superiors, the employees whom he supervises, and his associates at his own level in the company organization.

BS 679—Business Policy. 4 credits
Cutting across the whole field of business administration, this course approaches business policy making and administration from the top management point of view. Uses the case method to integrate knowledge the student has acquired in specialized courses. Required of all candidates for the M.B.A. degree.

BS 690—Business Research and Reports. 2 credits
Discovery and utilization of available information relating to individual business problems. Several reports required for development of skills in presentation and interpretation of research findings.

BS 691—Business Research and Reports. 2 credits
Continuation of BS 690. Both courses must be completed to receive credit. Required of all candidates for the M.B.A. degree.

BS 799—Doctoral Research. 1 to 12 credits

# ACCOUNTING

## GRADUATE FACULTY 1966-67

Stone, W. E., *Chairman*; Benninger, L. J.; DaVault, J. W.; Deinzer, H. T.; Peterson, E. G.; Ray, D. D.

For admission to graduate-level courses, the student normally must have been admitted to the Graduate School and should have had undergraduate courses in fields pertinent to the graduate courses selected; or, where necessary, special arrangements may be made with the approval of the department chairman.

Though no graduate major may be completed without adequate course work on the 600 or higher level, certain undergraduate courses in accounting

are available for graduate credit as a part of a candidate's major when specifically approved by the candidate's adviser.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ATG 501—Accounting Theory and its Applications 1. 3 credits
ATG 502—Accounting Theory and its Applications 2. 3 credits
ATG 503—Cost Accounting Theory and Application. 4 credits
ATG 504—Federal Income Taxation of Business Organizations. 3 credits
ATG 505—Federal Income Tax Planning. 3 credits

### GRADUATE COURSES

ATG 601—Contemporary Accounting Thought. 5 credits
Examination of institutional and individual developments in accounting theory construction with emphasis on identification of presuppositions and methodologies.
ATG 602—Accounting and Analytical Methods. 5 credits
The utilization of logic, including mathematics, in the formulation of alternative accounting valuation models and in the clarification of accounting concepts.
ATG 603—Social and Economic Accounting. 5 credits
Identical with ES 603. Prerequisite: ATG. 601. Social accounts and comparative economic accounting systems, with emphasis upon national income accounting, the national balance sheet, sector accounts and flow of funds analysis.
ATG 605—Accounting Structures in Federal Income Taxation. 5 credits
Prerequisite: ATG 407. Analysis of functions of income, flow and other accounting concepts involved in federal income taxation and financial accounting.
ATG 607—Cost Accounting Theory. 5 credits
Prerequisite: ATG 305. Study and research into the theoretical framework of cost accounting, both on a conceptual and system basis.
ATG 630—Individual Work in Accounting. 5 credits
Prerequisites: Permission of department and approval of Director of Graduate Studies. A reading and research course in several areas of accounting as needed by individual graduate students. May be repeated with change of content up to a maximum of 10 credits.
ATG 699—Master's Research. 0 to 9 credits. Maximum 24 credits
ATG 718—Evolution of Accounting Theory and Practice. 5 credits
Prerequisite: ATG 402. Historical development of accounting principles and practices and their relation to the fundamental principles of economics, law and finance.

## ECONOMICS

### GRADUATE FACULTY 1966-67

Donovan, C. H., *Chairman*; Anderson, M. D.; Blodgett, R. H.; Bradbury, R. W.; Eutsler, R. B.; Fristoe, C. W.; Goffman, I. J.; Hurff, G. B.; Jackson, E. L.; Kafoglis, M. Z.; Keig, N. G.; Koefod, P. E.; Langham, M. R.; Lassiter, R. L.; Locklin, D. P.; Osterbind, C. C.; Shields, M. W.; Sievers, A. M.; Tuttle, F. W.; Woodruff, William

Though no graduate major may be completed without adequate course work on the 600 or higher level, certain undergraduate courses in economics

are available for graduate credit as a part of a candidate's major. These are: ES 455—Government Control of Business; ES 410 and ES 411—Development of Modern Western Economy; ES 461—Business Cycles.

For admission to courses 600 and above the student must have been admitted to the Graduate School, and normally should have had undergraduate courses in fields pertinent to the graduate courses selected; or, where necessary, special arrangements may be made with the approval of the department head.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ES 513—Economic and Social History of Russia. 3 credits
ES 521—Central Banking and Monetary Policy. 5 credits
ES 531—Central Government Finance. 3 credits
ES 535—State and Local Finance. 3 credits
ES 543—Foreign Exchange and International Financial Institutions. 3 credits
ES 545—Financial Institutions and Fiscal Policies of Selected Latin American Countries. 3 credits
ES 561—Econometrics. 5 credits
ES 572—Economics of the Labor Market. 3 credits
ES 591—Masterpieces in the Social Sciences 1. 3 credits
ES 592—Masterpieces in the Social Sciences 2. 3 credits
ES 593—Masterpieces in the Social Sciences 3. 3 credits

## GRADUATE COURSES

ES 603—Social and Economic Accounting. 5 credits
Identical with ATG 603. A critical examination of social accounts and comparative economic accounting systems. Emphasis on national income accounting, the national balance sheet, sector accounts, and flow of funds analysis.

ES 605—The Development of Economic Thought. 5 credits
Analysis of the two chief approaches in economic thought, with emphasis on philosophical outlook and methodology. Stresses the analytical approach and the role of mathematics; calculus is surveyed and related to neo-classical theory. Relates the institutional approach to history and other social sciences; illustrated by a cultural theory of capitalist evolution.

ES 606—The Development of Economic Thought. 5 credits
Development of economic thought chronologically from Greek to contemporary times—including the chief schools in Great Britain, the Continent, and the United States. Marx and the socialists, nonorthodox thinkers, and critics of the classical school are treated equally with the main tradition.

ES 608—Present-Day Schools of Economic Thought. 5 credits
The main currents of contemporary American and English economic thinking with particular reference to the developments occurring between the two World Wars. The writings of Hansen, Mitchell, Clark, and Commons in the United States, and of Keynes, Cole, Robinson, and Hobson in England.

ES 610—The American Economy to 1860. 5 credits
A functional approach. World economic conditions that led to the settlement of America; the colonial period; the period of economic transition; the westward movement and the rise of a national economy; economic causes of the Civil War.

ES 611—THE AMERICAN ECONOMY SINCE 1860. 5 credits

The closing of the economic frontier. The development of a capitalistic economy and the trend toward economic and financial imperialism. Economic problems of the wars of 1914-18 and 1939-45, and postwar economic adjustments, domestic and foreign.

ES 615—ECONOMICS OF BUSINESS DECISIONS. 5 credits

Primarily for candidates for the degree Master of Business Administration. Economic principles directly related to managerial decisions. An attempt is made to synthesize the student's training in economic theory and in the fields of applied business practice.

ES 616—ECONOMIC ENVIRONMENT OF BUSINESS. 4 credits

Primarily for candidates for the degree Master of Business Administration. Gives the student a better grasp of the politico-economic environment in which he will be operating his business. History and analysis of modern economic performance and policy in the United States, with emphasis on current economic problems and their significance for business decision making.

ES 621—MONETARY THEORY. 5 credits

Prerequisite: ES 321 or an undergraduate major in economics. Evolutionary and contemporary aspects of monetary theory. The qualities and characteristics of money, rate of interest, effectiveness of monetary policy, flow of funds between the various sectors of the economy and the financial markets, the relationships between saving, investment, employment, price-level changes and capital formation.

ES 622—MONEY, PRICES, AND BUSINESS CYCLES. 5 credits

Prerequisite: ES 321. An analytical survey of the economic instabilities in capitalistic society, with emphasis on forces operating to bring about changes in the general level of prices, including prices of productive agents, employment and income.

ES 630—INDIVIDUAL WORK IN ECONOMICS. 1 to 9 credits

Prerequisite: Permission of the department and of the Director of Graduate Studies. Reading and/or research in the several areas of economics as needed by graduate students. May be repeated with change of content up to a maximum of 9 credits.

ES 631—THEORY OF PUBLIC FINANCE. 5 credits

Prerequisite: 12 credits in economics, including public finance. Theoretical aspects of the allocation and distribution functions of the modern state. Theories of public expenditure, tax incidence and effects, the burden of public debt.

ES 632—LOCATION OF ECONOMIC ACTIVITY. 5 credits

Conventional economic theory extended to consider space as an explicit variable and applied to two problems: (1) the principle governing location of agricultural and manufacturing industries; (2) the problem of optimum spatial distribution of social production. Case studies in industrial location and problem areas in regional and national development; emphasis on empirical research techniques.

ES 633—FISCAL AND MONETARY POLICY. 5 credits

Prerequisite: 12 credits in economics, including public finance. Development of tools for promoting economic stabilization and growth. Opposing viewpoints as to proper scope and relation of monetary and fiscal controls.

ES 635—WELFARE ECONOMICS. 5 credits

A survey of welfare economics. Technical welfare formulations related to organic concepts of welfare and to political action in a democracy. Possibilities of normative economics evaluated.

ES 637—Imperfect Competition. 5 credits
A comprehensive review of recent attempts to reconstruct economic theory in terms of "imperfect" or "monopolistic" competition.

ES 638—Security and Defense Policies Seminar 1. 5 credits
An interdisciplinary seminar examining the problems of American security and defense policies in the space age.

ES 639—Security and Defense Policies Seminar 2. 5 credits
Continuation of ES 638.

ES 641—Theory of International Trade. 5 credits
The historical and economic background of foreign trade; theory of international trade; fundamentals of international exchange; international commercial policies and international trade; exchange fluctuations and their control; international monetary institutions.

ES 644—International Economic Relations. 5 credits
A seminar dealing with issues of capital formation in the underdeveloped countries, economic integration, balances of payments and international monetary reform, the economic consequences of population pressures and economic relations between the advanced and other nations.

ES 645—The Economy of Spanish Latin America. 5 credits
Contemporary economic and commercial problems in Spanish Latin America; current developments in production, transportation, and trade of the various countries.

ES 646—The Economy of Brazil. 5 credits
Economic development and contemporary economic and commercial problems of Brazil; production, transportation, and trade from both a national and a regional point of view.

ES 647—Financial and Fiscal Institutions of Selected Subsaharan Countries. 5 credits
Public finance and the money and banking policies of representative countries of Africa.

ES 649—Economic Systems Seminar. 5 credits
Market and non-market types of economies, their characteristics and economics, and their different significance for systems of government and general social orders, legal and juridical systems, and for business and public policy.

ES 654—Economics of Regulated Industries. 5 credits
Prerequisites: ES 301, ES 302. Types and techniques of public control. Economic analysis and evaluation of regulatory and promotional policies. Administrative and legal aspects of the regulatory process. Special problems in particular industries.

ES 655—Industrial Organization and Social Control. 5 credits
Prerequisite: ES 455. Economic and other characteristics of modern industrial structures. Relationships between industrial structure, business conduct and economic performance. Measurement of concentration and evaluation of performance. Analysis of public policies toward monpoly, conspiracy and competition.

ES 657—Problems in Social Control. 5 credits
Prerequisites: ES 301, ES 302. Nature and causes of market failure. Problems in developing and applying concepts of public interest in a market economy. Institutional restraints to economic solutions; coordination of political and market decisions concerning the allocation of resources.

ES 660—Nonstochastic Econometric Models. 3 credits
Identical with AS 660. Prerequisite: Consent of instructor. Spatial equilibrium,

input-output and game theory models. A review of the general linear programming model and its basic theorems; integer and nonlinear programming.

ES 661—Econometric Methods 1. 3 credits

Identical with AS 661. Prerequisites: STA 440, consent of instructor. Stochastic models. The general linear model and problems associated with its use in econometric research. Errors in variables, autocorrelation and miscellaneous single-equation problems.

ES 662—Econometric Methods 2. 3 credits

Identical with AS 662. Prerequisite: ES 661 or AS 661. Continuation of ES 661. The theory of the simultaneous equation approach, model construction and estimating techniques.

ES 665—Mathematical Economics 1. 5 credits

A mathematical treatment of the theory of static equilibrium in economics based upon the works of Walrus, Pareto, Schultz, Hicks, and others.

ES 666—Mathematical Economics 2. 5 credits

Continuation of ES 665.

ES 669—Problems in Statistics and Business Forecasting. 5 credits

ES 672—Organized Labor in the United States. 5 credits

Problems connected with the relationship of organized labor with itself, management, government, and the public; labor policy and public welfare.

ES 674—Labor Economics. 5 credits

Various theories of wage determination and the role of wages in the economy; the effects of collective bargaining on wages, prices, and employment.

ES 691—Neo-Classical Economics 1. 5 credits

Analysis, criticism, and restatement of neo-classical price and production theories. Demand, supply, cost of production, and price determination under various conditions of the market. The writings of Marshall, Hicks, Boulding, Davenport, Stigler, Fellner, J. Robinson, and Chamberlain provide background for the discussion.

ES 692—Neo-Classical Economics 2. 5 credits

Continuation of ES 691. Analysis, criticism and restatement of neo-classical theories concerning distribution of income. Rent, interest, wages, profits, personal distribution, supplementary distribution and noncapitalistic distribution. The writings of Marshall, Hicks, Cassel, Boulding, Pigou, Fisher, Douglas, Knight, Stigler and Schumpeter provide background for the discussion.

ES 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ES 799—Doctoral Research. 1 to 12 credits

# FINANCE AND INSURANCE

## GRADUATE FACULTY 1966-67

Matthews, C. A., *Chairman*; Howard, W. M.; McFerrin, J. B.; Richardson, J. G.

Though no graduate major may be completed without adequate course work on the 600 or higher level, certain undergraduate courses in finance and insurance are available for graduate credit as a part of a candidate's major. These are: FI 420—Management of Bank Funds; FI 462—Group Insurance and Pension Plans; and the 500-level courses listed below.

For admission to courses 600 level and above, the student must have been

admitted to the Graduate School and normally should have undergraduate courses in fields pertinent to the graduate courses selected; or, where necessary, special arrangements may be made with the approval of the department chairman.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

FI 524—Investment Analysis. 5 credits
FI 528—Corporation Finance. 5 credits
FI 584—Legal Aspects of Insurance. 3 credits
FI 586—Estates, Trusts, and Insurance. 4 credits

## GRADUATE COURSES

FI 620—Problems in Commercial Banking. 5 credits
Prerequisite: FI 420. The theory of monopoly and competition as applied to banking; bank organization and structure, adequacy of bank capital, banking facilities, and bank services; problems of asset management and of providing successor management.

FI 622—Seminar in Investments. 5 credits
Prerequisite: FI 524. Individual research and group discussion employing materials available from publications and reports by governmental agencies and groups in the industry.

FI 625—Money and Capital Markets. 5 credits
Prerequisites: ES 521, central banking and monetary policy, and college level mathematics and statistics. Analysis of financial markets with emphasis on flow of funds, interest rate determination and allocation of resources; an empirical investigation of major current problems associated with financial markets.

FI 627—Problems in Corporation Finance. 5 credits
Prerequisites: FI 326 or FI 590, FI 528. An analysis of the concept and determination of the firm's cost of capital and of the utilization by the firm of its cost of capital in its investing and financing decisions.

FI 628—Central Banking Policies and Problems. 5 credits
Prerequisite: FI (ES) 325. The functions, powers and policies of central banks, the changing role of central banks in the economy, with emphasis on the place of central banks in a "free" economy and in a "state" economy.

FI 629—International Finance: Monetary Systems. 5 credits
Prerequisite: FI (ES) 325. Emphasizes factors leading to the breakdown of international monetary systems in the inter-war period, post-World War II international monetary problems, and attempts at reconstruction.

FI 630—Individual Work in Finance. 2 to 5 credits
Prerequisite: Permission of the department and of the Director of Graduate Studies. A reading and/or research course in the several areas of finance as needed by graduate students. May be repeated with change of content up to a maximum of 8 credits.

FI 662—Seminar in Life Insurance. 5 credits
Prerequisite: FI 462. Investigation of selected problems in life insurance and related fields.

FI 665—Seminar in Property and Liability Insurance. 5 credits
Prerequisites: FI 365, FI 366 or consent of instructor. A course designed to analyze the meaning, economic influences, social values, principles and practices of property and liability insurance.

FI 668—Problems in Risk Management. 3 credits
An examination of the insurance hazards of business concerns and governmental units, with consideration of insurance protection available.

FI 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# HEALTH AND HOSPITAL ADMINISTRATION

## GRADUATE FACULTY 1966-67

This program is administered by an interdisciplinary faculty, the members of which are: Champion, J. M., *Chairman*; Gue, R. L.; Martin, S. P.; Powers, L. S.

For admission to courses listed below, the student must have been admitted to the Graduate School, College of Business Administration and to the program in health and hospital administration.

For listings of other courses required of students enrolled in the program in health and hospital administration, see *Business Administration* (BS 610, BS 664, BS 671, BS 679, BS 690); Economics (ES 615, ES 616); Industrial Engineering (ISE 698); Law (LW 696).

## GRADUATE COURSES

HA 600—Perspectives in Health. 4 credits
A survey of factors operating in health and disease in an individual or a society. The historical and social background of concepts of disease, its etiology and the organization of medical care.

HA 601—Hospital Organization, the Community and Patient Care. 3 credits
The hospital culture in relation to organizational philosophy and changing health patterns, with emphasis on the patient care process; the concept and application of environmental therapy; current research in the hospital and health field.

HA 602—Financial Administration of Health and Hospital Care. 3 credits
The analysis of sources and uses of health care funds.

HA 610—Seminar in Health and Hospital Administration. 4 credits
Detailed study of the departmental organization of the general hospital, designed to help integrate course work with the administrative residency.

HA 611—Seminar in Health and Hospital Administration. 2 credits
Provides formal study, through readings, lectures and case discussions of major issues and problems in hospital organization and management.

HA 630—Individual Work in Hospital Administration. 2 credits
A reading and/or research course in hospital administration.

HA 631—Individual Work in Hospital Administration. 2 credits
Supervised field and research work in an administrative setting.

LW 696—Hospital and Health Law Seminar. 2 credits
Prerequisite: Consent of instructor. The law relating to hospital and medical administration. Designed especially for students enrolled in the graduate program in hospital and health administration.

# MANAGEMENT AND BUSINESS LAW

## GRADUATE FACULTY 1966-67

WILMOT, W. V., JR., *Chairman*; FOX, W. M.; JAMES, J. H.; WYATT, J. W.

For admission to courses numbered 600 and above, the student must have been admitted to the Graduate School and normally should have had undergraduate courses in fields pertinent to the graduate courses selected; or, where necessary, special arrangements may be made with the approval of the department chairman.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MGT 570—PRODUCTION MANAGEMENT PROBLEMS. 5 credits
MGT 571—MANAGERIAL OPERATIONS ANALYSIS 2. 4 credits

## GRADUATE COURSES

MGT 601—LEGAL PROBLEMS OF MANAGEMENT. 3 credits
Prerequisites: MGT 401, permission of department. Special legal problems of business management.

MGT 610—MANAGERIAL PLANNING. 4 credits
Explicit treatment of the managerial functions of planning. Consideration of the requirements and complexities of corporate planning activity. Development of the theoretical basis of the planning process.

MGT 611—THEORY OF MANAGERIAL ORGANIZATION AND CONTROL. 4 credits
The development and present status of organization and control theory; methods and procedures for regulating activities required to channel managerial operations within requirements of predetermined plans.

MGT 614—SEMINAR IN MANAGEMENT. 3 credits
Prerequisites: MGT 610, MGT 611. Historical foundations and evolutionary development of management concepts; comparative analysis of management patterns; emerging problems of management interests.

MGT 630—INDIVIDUAL WORK IN MANAGEMENT. 3 or 4 credits
Prerequisites: Permission of department and the Director of Graduate Studies. Reading and/or research in management as needed by graduate students. May be repeated with change of content up to a maximum of 8 credits.

MGT 650—PERSONNEL TECHNIQUES AND ADMINISTRATION. 4 credits
Prerequisite: MGT 450 or consent of instructor. Emphasizes study of realistic cases which point up the organizational, human relations and administrative problems of the personnel administrator.

MGT 660—PROBLEMS IN COLLECTIVE BARGAINING. 4 credits
An examination of the history, present status and trends of collective bargaining, with an analysis of its economic, social and legal aspects.

MGT 690—SPECIAL TOPICS IN MANAGEMENT. 3 credits
Prerequisite: Permission of department. Topics more specialized or advanced than those given in regularly listed courses. Students desiring to take MGT 690 should consult the department well in advance of registration.

MGT 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

# MARKETING

## GRADUATE FACULTY 1966-1967

BUTTERWORTH, J. D., *Chairman*; HEIDINGSFIELD, M. S.; OSTERBIND, C. C.; THOMPSON, R. B.; YODER, L. C.

Though no graduate major may be completed without adequate course work on the 600 or higher level, MKG 451—Advertising Problems may be taken for graduate major credit.

For admission to courses listed below, the student must have been admitted to the Graduate School, and normally should have had undergraduate courses in fields pertinent to the graduate courses selected; or, where necessary, special arrangements may be made with the approval of the department chairman.

## GRADUATE COURSES

MKG 621—INTERNATIONAL MARKETING. 5 credits

Prerequisites: MKG 531, permission of department. The development of strategies leading to the penetration of foreign markets.

MKG 630—INDIVIDUAL WORK. 5 credits

Prerequisite: Permission of department. Reading and/or research in the several areas of marketing as needed by graduate students. May be repeated with change of content up to a maximum of 15 credits.

MKG 631—SEMINAR IN MARKETING THEORY. 5 credits

Prerequisites: MKG 531, permission of department. An advanced analysis of principles, theories and problems in marketing. Consideration is given to the functional, institutional, cost and historical approaches from both the social and firm points of view.

MKG 639—SEMINAR IN MARKETING MANAGEMENT. 5 credits

Prerequisites: MKG 531, permission of the department. An advanced case course dealing with the wide range of operational problems faced by the marketing manager.

MKG 641—PROBLEMS OF SALES MANAGEMENT. 4 credits

Prerequisites: MKG 531, MKG 441. Analysis of the field, the processes, the problems and the policies of sales force management.

MKG 661—PROBLEMS IN RETAIL STORE MANAGEMENT. 4 credits

Prerequisites: MKG 531, MKG 362. Policies, methods and facilities having to do with organization, structure, store location, layout, merchandising, customer services, merchandise handling, expense productivity and control, executive and other personnel incentives, reports and ratios useful to management, and subjects of interest to proprietors and managers.

MKG 671—SEMINAR IN MARKETING RESEARCH. 5 credits

Prerequisites: MKG 531 and six credits of statistics or undergraduate marketing research. Designed to provide students with thorough understanding and practice in the application of the scientific method to the solution of marketing problems.

MKG 681—MERCANTILE AND CONSUMER CREDIT MANAGEMENT. 4 credits

Prerequisites: FI 326, MKG 481. A case course dealing with policy formation and decision making in the administration of consumer and mercantile credit.

MKG 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

# REAL ESTATE AND URBAN LAND STUDIES

## GRADUATE FACULTY 1966-67

RING, A. A., *Chairman*; CURTIS, C. C.; HESS, N. R.

Though no graduate major may be completed without adequate course work on the 600 or higher level, certain undergraduate courses in real estate are available for graduate credit as part of a candidate's major. These are: RE 490—Real Estate Appraising; RE 480—Real Estate Finance.

For admission to courses listed below, the student must have had undergraduate courses in fields pertinent to the graduate courses selected; or, where necessary, special arrangements may be made with the approval of the department chairman.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

RE 590—CASE STUDIES IN REAL ESTATE APPRAISING. 3 credits

RE 595—INDUSTRIAL AND COMMERCIAL REAL ESTATE PRINCIPLES AND PROBLEMS. 3 credits

## GRADUATE COURSES

RE 630—INDIVIDUAL WORK. 4 credits

Prerequisite: Permission of department. Reading or research in real estate and urban land studies. May be repeated with change of content up to a maximum of 12 credits.

RE 650—REAL ESTATE INVESTMENTS, PRINCIPLES AND PRACTICES. 4 credits

Analysis of real estate from the investor's point of view. The impact of taxation upon real estate investments. Emphasis on case studies and problems.

RE 660—RESEARCH IN REAL ESTATE BROKERAGE, MANAGEMENT AND LAW. 4 credits

A critical study of selected methods and practices of real estate brokerage, and analysis of real property management as it affects brokerage practices.

RE 670—PROBLEMS OF URBAN GROWTH AND REGIONAL PLANNING. 4 credits

Study of economic factors which provide the basis of the urban economy and urban growth. Urbanization; regional planning; locations of cities and industries; private and public controls over urban land utilization and their impact upon the future of cities.

RE 680—PROBLEMS IN REAL ESTATE FINANCE. 4 credits

Techniques of mortgage risk analysis, mortgage risk rating, trading on the equity, long and short term financing, problems encountered in slum clearance, subdivision and urban redevelopment.

RE 690—PROBLEMS IN PROPERTY VALUATION. 4 credits

Appraising techniques and problems of income-producing properties. Class work coordinated with field investigation and field reports.

RE 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

# COLLEGE OF EDUCATION

GENERAL

ADMINISTRATION AND SUPERVISION

ELEMENTARY

FOUNDATIONS

PERSONNEL SERVICES

SECONDARY

AGRICULTURAL AND EXTENSION
(AGRICULTURAL EDUCATION)

# EDUCATION—GENERAL

## GRADUATE FACULTY 1966-67

AHRENS, M. R. *Chairman*; ALEXANDER, W. M.; AMBROSE, E. V.; BINGHAM, N. E.; BROWN, B. B.; CATE, C. A.; COOPER, J.; DURRANCE, C. L.; EGGERT, C. L.; HASS, C. G.; HILLIARD, F. P.; KIDD, K. P.; LAVIRE, W. A.; MCCRACKEN, J. M.; MOORMAN, J. H.; MYERS, R. B.; OLIVA, P. F.; SPACHE, G. D.; WHITE, J. B.; WIEGMAN, R. R.; WILES, K.; WILLIAMS, E. L.

## CROSS-DEPARTMENTAL COURSES FOR SPECIAL AREAS

College and Community College Teaching
- ED 640
- ED 641
- ED 642
- ED 743

Curriculum and Instruction
- ED 600
- ED 700
- ED 701
- ED 740
- ED 741
- ED 742
- ED 750

## GRADUATE COURSES

ED 600—THE SCHOOL CURRICULUM. 4 credits
An analysis of philosophic and research bases underlying the development of the total school program from kindergarten through community college. Basic curriculum course for all graduate students.

ED 630—INDIVIDUAL WORK. 2 to 9 credits
For advanced students who wish to study individual problems under faculty guidance. Before registering in this course, a student must have approval of the proposed project. May be repeated with change of content up to a maximum of 9 credits.

ED 633—METHODS AND PROBLEMS OF SUPERVISION. 4 credits
Prerequisite: EDA 631. Critical study of methods of improving instruction.

ED 634—GROUP PROCESS IN EDUCATION. 4 credits
A study of group organization and operation, with opportunity to develop skills in group leadership and interpretation of group interaction.

ED 640—COLLEGE CURRICULUM AND TEACHING. 4 credits
Development, functions and problems of colleges in the American society. Emphasis on curriculum, learning process and teaching procedures, instructional aids, and evaluation.

ED 641—PRACTICUM IN COLLEGE TEACHING 1. 4 credits
Prior arrangements must be made with the coordinating professor of the College of Education. Provision is made for the student to teach under the supervision of a professor in his academic field.

ED 642—PRACTICUM IN COLLEGE TEACHING 2. 4 credits
Prior arrangements must be made with the coordinating professor of the College of Education. Continuation of ED 641.

ED 648—PROBLEMS IN CURRICULUM AND INSTRUCTION. 3 to 15 credits
Covers topics not available in regularly listed courses. To be used for credit

in institutes, workshops and short credit courses. May be repeated with change of content up to a maximum of 15 credits.

ED 649—Subject-Area Planning for Elementary Teachers. 3 to 6 credits

Offered only by extension. A workshop for the development of individual, city-wide or county-wide plans for improving programs in language arts, social studies, mathematics, health, art, music, science, etc. May be repeated with change of content up to a maximum of 6 credits.

ED 651—Audio-Visual Education. 4 credits

An overview of the various communication media available to the classroom teacher and an analysis of their theoretical bases in terms of current learning theory.

ED 652—Production and Utilization of Audio-Visual Materials. 4 credits

Prerequisite: ED 651 or consent of instructor. Designed to train materials supervisors, audio-visual coordinators and other school personnel in the production of materials by photographic processes.

ED 653—Organization and Operation of a Materials-of-Instruction Program. 4 credits

Prerequisite: ED 418 or ED 651. The administration of a school or county materials-of-instruction program, including arrangement of materials and equipment, organization and operation, financial report, standards, physical plant functions and evaluation.

ED 654—Programmed Instructional Material. 4 credits

Evaluation and effective use of programmed instructional materials. Practice in construction of programmed materials provided in student's area of emphasis.

ED 655—Mental Health in the Classroom. 4 credits

Designed to assist teachers, principals and supervisors in developing sound principles for creating a healthful classroom environment.

ED 657—Florida Workshop: Bulletin Series Division. 3 to 6 credits

Assistance for principals and teachers engaged in the preparation of curriculum bulletins. Registration limited to selected personnel. May be repeated with change of content up to a maximum of 6 credits.

ED 659—Laboratory in Corrective Reading. 9 credits

Prerequisite or corequisite: EDE 675. The diagnosis, correction, and prevention of reading difficulties in both elementary and secondary schools; work with children in the application of principles under study.

ED 660—Subject-Area Planning for Secondary Teachers. 4 credits

Offered only by extension. A workshop for the development of individual, city-wide, or county-wide plans for improving instruction in secondary school subjects.

ED 661—Problems in Reading. 4 credits

Prerequisites: EDE 675 and ED 659. Specific reading problems, such as those encountered in the classroom situation, will be selected for exhaustive study by individuals or small groups; the teaching of reading on any grade level.

ED 663—Music in the Elementary School. 3 credits

Offered only by extension. An in-service training course open to elementary school teachers. The purpose is to give in-service training to persons engaged in music teaching through research work under supervision of the chairman of the Department of Music.

ED 664—Vocal Music in the Secondary School. 3 credits
Offered only by extension. An in-service training course open only to vocal music teachers. The purpose is to give in-service training to persons engaged in vocal music teaching by doing research work under supervision of the chairman of the Department of Music.

ED 665—Orchestra Music in the Public Schools. 3 credits
Offered only by extension. An in-service training course open to instrumental music teachers. The purpose is to give in-service training to persons engaged in instrumental music teaching through research work under supervision of the chairman of the Department of Music.

ED 666—Band Music in the Public Schools. 3 credits
Offered only by extension. An in-service training course open only to instrumental music teachers. The purpose is to give in-service training to persons engaged in instrumental music teaching through research work under supervision of the chairman of the Department of Music.

ED 670—Workshop in Human Relations in Education. 3 to 9 credits
Exploration of principles and practices in the field of human relations and their implications for interpersonal and intergroup problems in the family, school and community. May be repeated with change of content up to a maximum of 9 credits.

ED 682—Field Laboratory for Faculty Study of Special Problems. 3 to 9 credits
Offered only by extension. To assist teachers in single schools, groups of schools, or county systems in improving certain subject areas or in working on special problems within the system. May be repeated with change of content up to a maximum of 9 credits.

ED 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ED 700—Instruction: Theory and Research. 4 credits
Prerequisite: ED 600. Investigation of theories of instruction and research in the learning process, mental health, creativity, the thought process, human relations, group dynamics, communication and other fields contributing to a theory of instruction.

ED 701—Curriculum: Theory and Research. 4 credits
Prerequisite: ED 600. Investigation of theories of curriculum and organization, and a survey of curriculum research and patterns of curriculum.

ED 731—Work of the Director of Curriculum. 4 credits
Admission by permission of the instructor. The duties of the director of curriculum examined from the standpoint of their administrative, coordinative, supervisory, and research aspects.

ED 740—Programs of Teacher Education. 4 credits
An analysis of the organization and problems of teacher education institutions; types of students, patterns of curricula, functions of staff, significant organizations and agencies and special studies.

ED 741—Internship in Teacher Education 1. 4 credits
Study of the problems of pre-service teacher education and participation in the planning and teaching of pre-service courses.

ED 742—Internship in Teacher Education 2. 4 credits
Continuation of ED 741.

ED 743—Seminar: General Education for Colleges. 4 credits
Investigation of the forces contributing to the general education movement;

objectives of general education; types of courses and programs, content of courses, and instructional approaches.

ED 750—SEMINAR: EDUCATION FOR TODAY. 4 credits

Prerequisite: ED 600. An analysis of the operation of education in present-day society and the relationships among the various phases of education from early childhood through adulthood.

ED 751—MATHEMATICS EDUCATION SEMINAR. 4 credits

Prerequisites: EDS 650 or EDE 650 and consent of instructor. Issues and problems in mathematics education and the investigation and planning of research relevant to selected problems.

ED 760—SCIENCE EDUCATION SEMINAR. 4 credits

Prerequisite: EDS 660 or consent of instructor. Issues and the problems in science education and the investigation and planning of research relevant to selected problems.

ED 799—DOCTORAL RESEARCH. 1 to 12 credits

# EDUCATION—ADMINISTRATION AND SUPERVISION

## GRADUATE FACULTY 1966-67

KIMBROUGH, R. B., *Chairman*; AHRENS, M. R.; EGGERT, C. L.; HASS, C. G.; JOHNS, R. L.; KURTH, E. L.; LAVIRE, W. A.; LEPS, J. M.; MYERS, R. B.; PERKINS, R. P.; TODD, E. A.; WHITE, J. B.; WIEGMAN, R. R.

## GRADUATE COURSES

EDA 600—EDUCATIONAL ORGANIZATION AND ADMINISTATION. 4 credits

The foundation course in school administration. Basic concepts, principles, and practices in local, state, and federal organization and administration.

EDA 601—ORGANIZATION AND ADMINISTRATION OF ELEMENTARY SCHOOLS. 4 credits

The organization and administration of elementary schools in the light of purposes and functions. Special emphasis on the skills and competencies desirable for leadership at a school center.

EDA 602—ORGANIZATION AND ADMINISTRATION OF SECONDARY SCHOOLS. 4 credits

Duties and responsibilities of the school principal; competencies necessary for leadership in organizing, administering, supervising and evaluating the secondary school center.

EDA 603—PUBLIC SCHOOL FINANCE. 4 credits

State, local, and federal financing of education; the foundation program of school financing; principles and criteria of taxation for education; education and the national economy.

EDA 604—LEGAL PHASES OF PUBLIC SCHOOL ADMINISTRATION. 4 credits

The legal status of schools in the United States; emphasizes Florida conditions, school laws, constitutional provisions, judicial decisions, Attorney General's rulings and regulations of the State Board of Education.

EDA 605—PUBLIC SCHOOL BUSINESS ADMINISTRATION. 4 credits

School financial accounting; the preparation and administration of budgets; purchasing procedures; the issuance of school securities; central services of public school business administration.

EDA 606—Supervised Practice in School Administration. 4 credits
Only advanced graduate students are permitted to enroll. Students are given opportunity to perform administrative duties under supervision. May be repeated with change of content up to a maximum of 8 credits.

EDA 607—Administration of School Personnel. 4 credits
Problems of the professional school staff and the administration of staff personnel in the public schools.

EDA 609—Problems in School Administration and Supervision. 4 credits
An in-service training course through regularly scheduled on-campus work conferences open only to superintendents and supervisors; or a problems course, offered through extension or on campus, for superintendents, supervisors, principals, junior college administrators, and trainees for such positions. May be repeated with change of content up to a maximum of 8 credits.

EDA 610—Organization and Administration of Adult Education. 4 credits
Overview of adult education in the United States; the role of administration in adult education; the job of the local director of adult education; Florida law and regulations relating to adult education in the public schools.

EDA 630—Individual Work. 4 credits
For advanced students who wish to undertake an individual research project directly related to administration and supervision. May be repeated with change of content up to a maximum of 12 credits.

EDA 631—Educational Leadership 1. 4 credits
The basic course on the nature of educational leadership. Emphasis on the role of official leadership in group development, improving group structure and program improvements.

EDA 632—Educational Leadership 2. 4 credits
Contemporary research on the diffusion of innovations, the planning of change, organizational theory and political power in policy decision-making. The role of educational administrators and instructional leaders in the establishment of educational policies.

EDA 700—School Survey. 4 credits
School survey techniques and their application; long-term planning of educational programs. Field experience in school surveys made available to students taking the course.

EDA 702—The School Plant. 4 credits
Planning of building programs and planning of school buildings in relation to the instructional needs; maintenance, operation, and utilization of school plants.

EDA 704—College Administration. 4 credits
Educational policies, functions and practices in the administration of higher institutions.

EDA 706—Seminar: Theories of Educational Administration. 4 credits
Prerequisite: One year of graduate study. Basic theories of the organization and administration of public education; historical origins of theories; assumptions underlying current concepts of administration and theory development.

EDA 707—Research Design in Educational Administration. 4 credits
Prerequisite: EDF 360. Open only to students in the advanced school. The approaches to and resources for research in educational administration, based on a background of organizational and administrative theory. Individually identified

problems in administration conceptualized in theoretical terms and appropriate research procedures determined.

EDA 730—Practicum in Supervision and Administration. 3 to 15 credits

A seminar and an internship in administration and supervision. May be repeated with change of content up to a maximum of 15 credits.

# EDUCATION—ELEMENTARY

## GRADUATE FACULTY 1966-67

Hilliard, F. P., *Chairman*; Ahrens, M. R.; Ambrose, E. V.; Brown, B.; Cooper, J.; McCracken, J. M.; Newcomb, A.; Olson, W.; Sheckles, M. E.; Spache, G. D.; Tison, J. P.; Watkins, M. C.; Wenzel, E.; White, J. B.; Young, G. M.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EDE 500—Seminar in Elementary Education 1. 4 credits
EDE 550—Teaching of Modern Mathematics. 4 credits
EDE 560—Teaching of Science in the Elementary Schools. 4 credits
EDE 570—Teaching of Reading. 4 credits

## GRADUATE COURSES

EDE 600—Elementary School Curriculum. 4 credits

Prerequisite: ED 600 or a course in curriculum. A survey of the content and methods of the elementary school curriculum. Offered primarily for students who have not taken a course in elementary curriculum and who have not had teaching experience in the elementary schools.

EDE 601—Practices in Elementary Education. 4 credits

Prerequisite: Course background in elementary curriculum or teaching experience in the elementary school. Practices in the elementary school in relation to fundamental principles of curriculum development. Emphasizes selection, organization and development of effective teaching-learning situations.

EDE 603—Early Childhood Education 1. 4 credits

Study of curriculum for nursery school and kindergarten.

EDE 604—Early Childhood Education 2. 4 credits

Consent of instructor. Continuation of study of curriculum for nursery school and kindergarten. Includes observation and participation.

EDE 620—Social Studies Education-Elementary School. 4 credits

Prerequisite: Graduate curriculum course or consent of instructor. Contributions of social education to the total elementary school program, with emphasis on social interaction and programs and procedures in social studies area.

EDE 635—Supervision of Pre-Service Teachers 1. 4 credits

Open to graduate students with certification and background in elementary education, or consent of instructor. Problems and issues of pre-service teacher education, with particular emphasis on procedures of supervising interns.

EDE 636—Supervision of Pre-Service Teachers 2. 4 credits

Prerequisite: EDE 635. Continuation of EDE 635.

EDE 650—Mathematics in the Elementary School. 4 credits

Prerequisite: EDE 550. Recent research, patterns of curriculum, techniques of

teaching and use of instructional media. Primarily for elementary teachers who desire specialization in mathematics education.

EDE 660—Science Education in the Elementary School. 4 credits
Prerequisite: GL 301 or EDE 560. Current problems and approaches in teaching science in elementary schools. New materials and techniques of teaching. Research and recent developments in the sciences, and their implication.

EDE 670—Language Arts in the Elementary School 1. 4 credits
Prerequisite: EDE 301. Creative and skill aspects of the language arts in the elementary school, including oral expression, listening, usage, vocabulary building, reading, writing and handwriting.

EDE 671—Language Arts in the Elementary School 2. 4 credits
Prerequisite: EDE 670. Speaking, listening, reading and writing; their place in the total school program. Current interests, issues and trends in teaching in the light of current research.

EDE 675—Trends in the Teaching of Reading. 4 credits
Prerequisite: EDE 570. Analysis of trends in the teaching of reading as shown in current methods and research. Includes consideration of controversial issues and future trends in classroom organization, methods and materials.

EDE 700—Problems in Elementary Education 1. 4 credits
Advanced course in elementary school curriculum.

EDE 701—Problems in Elementary Education 2. 4 credits
Continuation of EDE 700.

EDE 702—Evaluation in the Elementary School. 4 credits
Point of view, methods and techniques used in appraising the behavioral growth of pupils; evaluation of the objectives of the total elementary school program.

EDE 703—Seminar in Elementary Education 2. 4 or 8 credits
Open to advanced graduate students upon consent of the staff of elementary education. Critical examination of current research and an overview of the total program in elementary education. May be repeated with change of content up to a maximum of 8 credits.

# EDUCATION—FOUNDATIONS

## GRADUATE FACULTY 1966-67

Gordon, I. J., *Chairman*; Avila, D. L.; Baker, M. C.; Combs, A. W.; Cumbee, C. F.; Curran, R. L.; Guertin, W. H.; Hines, V. A.; Lewis, H. G.; McLendon, I. R.; Purkey, W. W.; Renner, R. R.; Scates, D. E.

## GRADUATE COURSES

EDF 600—History of Education. 5 credits
Designed to help the teacher participate in solving professional problems through perspective gained from a survey of education from primitive times to the present.

EDF 601—Ancient and Medieval Education. 5 credits
Characteristic features of pedagogical practice and thought in China, India, Semitic nations, Greece, Rome, Islam and medieval and renaissance Europe.

EDF 610—Philosophical Foundations of Education. 5 credits
The philosophical bases for democracy and education.

EDF 620—Socio-Economic Foundations of Education. 5 credits
A comprehensive survey of the socio-economic bases for education.

EDF 631—Comparative Education. 5 credits
The relationships of school and society in different cultural areas of the world.

EDF 640—Educational Psychology: Human Development. 5 credits
Current research and theories in the area of human development.

EDF 641—Educational Psychology: Personality Dynamics. 5 credits
The dynamics of behavior and their implications for education, counseling and guidance, administration, family relationships and social action.

EDF 643—Educational Psychology: Learning Theory. 5 credits
The logic and methodologies of theories of learning.

EDF 644—Laboratory in Human Development 1. 5 credits
Open to teachers working with students at the time of enrollment in the course or in special workshops.

EDF 645—Laboratory in Human Development 2. 5 credits
Prerequisite: EDF 644. Continuation of EDF 644.

EDF 646—Educational Psychology: General. 5 credits
Basic principles, techniques and research in educational psychology; designed for graduate students preparing to teach who have a minimal background in psychology. Not open to students majoring in psychology or psychological foundations of education.

EDF 650—Measurement and Evaluation. 5 credits
Classroom procedures for measurement and evaluation designed to help teachers interpret results of tests and other evaluative devices used in their classes.

EDF 660—Educational Statistics. 5 credits
Prerequisite: EDF 360 or consent of instructor. Statistical methods as applied to educational data and problems.

EDF 661—Computers in Educational Research. 5 credits
Prerequisites: EDF 360, EDF 450. Corequisite: EDF 600. Introduction to computer principles and programming, including practice problems on Computer Center equipment. Application to complex statistical analyses and educational research.

EDF 662—Laboratory in Educational Research. 5 credits
Prerequisites: EDF 360, EDF 450 (one may be taken as corequisite), consent of department. Experience in conducting single phases of on-going research under individual supervision.

EDF 663—Research Methods in Education. 5 credits
Prerequisite: EDF 360 or EDF 450. Research methods applicable to classroom practices. Can not be used to meet the research preparation requirement for the Ed.D. degree.

EDF 664—Quantitative Foundations of Educational Research. 10 credits
Integrated coverage through team teaching of fundamentals. Includes statistics, design, data processing and familiarization with the general field of educational research. Not for credit if student has credits in EDF 660, EDF 661 or EDF 663.

EDF 701—Educational Classics. 5 credits
Prerequisite: EDF 600. An examination of the enduring writings on education from ancient to modern times.

EDF 710—Education and Moral and Spiritual Ideas. 5 credits
Consideration of types of moral ideas, of the relation of moral values to school subjects, and of the question of direction and systematic moral and spiritual instruction in the schools.

EDF 711—Theories of Mind. 5 credits

Conceptions of mind and thinking processes, with implications for curriculum organization and classroom practice.

EDF 712—Contemporary Educational Theories. 5 credits

A seminar for post-master's students. A critical study of contemporary philosophical theories of education.

EDF 720—School and Society. 5 credits

Open only to candidates for the Ed.S. or Ed.D. degrees. Provides a social and philosophic frame of reference through study of the society in which education takes place and the implication of this society for the functioning of the school.

EDF 740—Educational Psychology: Cognition in the Educative Process. 5 credits

Prerequisites: EDF 640, consent of instructor. A thorough review of the field of cognitive development as it is applied to curriculum development and teaching procedures.

EDF 741—Educational Implications of Perceptual Psychology. 5 credits

Prerequisites: EDF 641, consent of instructor. Intensive exploration of the research literature on human behavior and its implications for educational theory and practice.

EDF 760—Techniques of Research. 5 credits

A required course for Ed.D. degree candidates. Training in identifying research problems, in organizing useful means for research, and in interpreting and reporting observed phenomena.

EDF 764—Advanced Quantitative Foundations of Educational Research. 10 credits

Prerequisite: EDF 664. Integrated coverage, through team-teaching, of important approaches to educational research. Includes advanced statistics, design, computer applications and analysis of selected researches.

EDF 765—Seminar in Educational Research. 4 credits

Prerequisite: EDF 664. Corequisite: EDF 764. Analysis of a wide variety of educational researches to develop appreciation of the scope of the investigations and understanding of the methodological techniques employed.

EDF 766—Analysis of Educational Research. 4 credits

Prerequisites: EDF 664, EDF 764. Corequisite: EDF 765. Analysis of several educational researches to provide intensive appreciation of important methodological techniques and newer approaches in educational research.

EDF 780—Seminar in Educational Foundations. 5 credits

Issues in the historical, philosophical, social, psychological, aesthetic and comparative foundations of education. May be repeated with change of content up to a maximum of 15 credits.

## EDUCATION—PERSONNEL SERVICES

### GRADUATE FACULTY 1966–67

Stripling, R. O., *Chairman*; Alper, A. E.; Antenen, W. W.; Bristol, L. R.; Carter, T. A.; Childers, P. R.; Cortazzo, A. D.; Cosby, B.; Cranney, G.; Cunningham, M. A.; Hasterok, G. S.; Kline, W. E.; Landsman, T.; Lane, D.; Lister, J. L.; Mayer, W. K.; Riker, H. C.; Sharp, B. L.; Spache, G. D.; Wood, C. G.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EDP 500—Materials and Methods for Teaching Slow Learners. 4 credits

EDP 501—Teaching the Mentally Retarded. 4 credits

EDP 503—Teaching Neurologically Damaged Children. 4 credits

EDP 504—Teaching Emotionally Disturbed and Socially Maladjusted Children. 4 credits

## GRADUATE COURSES

EDP 600—Teaching Exceptional Children. 3 credits

Prerequisite: EDP 300 or PSY 312. The care, treatment and education of children with problems and handicaps.

EDP 601—Education of the Mentally Retarded. 4 credits

Prerequisites: EDP 500 or 501; EDP 503. Development of school programs for the retarded. Educational provisions for the retarded who are affected by environmental deprivation and sensory and other impairment.

EDP 603—Education of the Gifted Child. 3 credits

Definitions of giftedness, characteristics of gifted children and outside of school influences which affect the achievement of gifted children.

EDP 604—Theories of Learning Disabilities. 5 credits

Prerequisites: EDP 503, EDP 601 and six credits of psychology. Current major theories in the development of educational programs for children with learning impairments due to neurological injury, emotional problems or sensory deprivation.

EDP 605—Diagnosis and Educational Practice in Learning Disabilities. 3 credits

Prerequisite: EDP 604. A clinical course in the diagnosis of educational disabilities with emphasis on psycholinguistics, learning disabilities and perceptual disorders.

EDP 607—Laboratory: Evaluation in Special Education. 3 to 6 credits

Prerequisites: EDF 450 or PSY 503, PSY 504 and consent of instructor. Open only to majors in special education. Tests and other instruments used in evaluating pupils with learning disabilities. May be repeated with change of content up to a maximum of 6 credits.

EDP 609—Seminar in Education of Emotionally Disturbed Children. 4 credits

Prerequisites: EDP 504, PSY 410 and consent of instructor. Students preparing to teach emotionally disturbed children will examine and critique research in this field. Emphasis on differentiation of instruction for the several types of disturbed children served in various educational settings.

EDP 610—Principles of Guidance: The Helping Relationship. 3 credits

Prerequisite or corequisite: EDF 641. The theoretical bases of guidance and counseling. Common and divergent principles for helping the individual's personal growth as discovered in formal, informal and professional human relationships.

EDP 611—Vocational Development. 3 credits

An examination of the current theories of vocational development and the role of occupational and educational information in the individual's vocational development process.

EDP 612—Techniques of Guidance and Personnel Work. 5 credits

Prerequisite: EDF 440 or EDF 442. Guidance practices for teachers, super-

visors, administrators and other school personnel not majoring in guidance and personnel work.

EDP 613—Personnel Testing. 4 credits

Prerequisite: EDF 360 or EDF 450. Principles underlying the selection and application of typical psychological tests used in counseling and personnel work. Emphasis on the use of tests in counseling for the facilitation of self-understanding.

EDP 614—Individual and Group Counseling Theory. 5 credits

Prerequisites or corequisites: EDF 641, EDP 610. Concurrent registration in EDP 620 required. Major contemporary and historical theories in counseling including Freudian, neo-Freudian, Rogerian, existential and behavioristic.

EDP 615—Supervised Practice in Individual and Group Counseling 1. 3 credits

Prerequisites: EDP 614, EDP 620. Supervised practice in individual and group counseling in a setting appropriate to the student's professional objectives.

EDP 618—Organization and Administration of Guidance and Personnel Programs. 3 credits

Prerequisite or corequisite: EDP 614. Methods of organizing and administering guidance and personnel programs in educational institutions and allied agencies.

EDP 619—Supervised Practice in Individual and Group Counseling 2. 3 credits

Prerequisites: EDP 614, EDP 620. Supervised practice in individual and group counseling in a setting appropriate to the student's professional objectives.

EDP 620—Laboratory in Individual and Group Counseling. 1 credit

Concurrent registration in EDP 614 required. A minimum of 3 clock hours per week spent in audio and video recording of role playing, discussion of professional films and tape recordings in counseling, and observations of counseling. Introduction to the supervisory and consultative relationships in counseling.

EDP 622—Counseling with Children. 4 credits

Prerequisites: EDP 614, EDF 640, and consent of instructor. The theoretical development of the counseling relationship as it applies to children. Emphasis on play techniques and development of new approaches toward helping children achieve high-level personal fulfillment.

EDP 625—Supervised Professional Experience in Guidance. 5 to 10 credits

Prerequisites: EDP 615, EDP 619, and consent of instructor three months prior to registration for the course. Full-time supervised field work at the end of the master's degree program, with an emphasis on the counseling relationship. (Ten credits required of all master's degree candidates in elementary and secondary school counselor education who do not meet "practical experience" requirements for Florida certification in guidance.) May be repeated with change of content up to a maximum of 10 credits.

EDP 640—Student Personnel Services in Higher Education. 4 credits

Prerequisite: EDP 610. Student personnel programs in junior colleges, colleges and universities. Study of philosophy, organization and administration of these programs within the context of the purposes and programs of higher educational institutions.

EDP 641—The College Community and the Student. 4 credits

Prerequisite: EDP 610. The mores of the college community, the characteristics of the college student, and the relationship of these to personal, social and intellectual development.

EDP 659—Seminar for Counseling in Specialized Settings. 3 credits

Prerequisite: One year of experience in the pertinent setting or completion of first year of two-year counselor education program. A specially arranged seminar for groups of students with common professional objectives within a specific setting such as the employment service, camps, adult education center, or religious, geriatric or correctional agencies.

EDP 660—Problems in Personnel Work. 3 to 10 credits

A seminar in special problems arranged by the department for persons engaged in personnel work in education or allied areas. May be repeated with change of content up to a maximum of 10 credits.

EDP 670—Practicum in Special Education: Mental Retardation. 4 to 12 credits

Prerequisites: EDP 500, EDP 501, EDP 601, and written request six weeks prior to registration for permission to enroll. Tutoring mentally retarded children in educational situations appropriate to the student's professional goals. May be repeated with change of content up to a maximum of 12 credits.

EDP 671—Practicum in Special Education: Emotional Disturbance. 4 to 12 credits

Prerequisites: EDP 504, six credits psychology, and written request six weeks prior to registration to enroll. Tutoring emotionally disturbed children. May be repeated with change of content up to a maximum of 12 credits.

EDP 672—Practicum in Special Education: Learning Disabilities. 4 to 12 credits

Prerequisites: EDP 503, EDP 604, six credits of psychology, and written request six weeks prior to registration for permission to enroll. Tutoring children diagnosed as perceptually impaired. May be repeated with change of content up to a maximum of 12 credits.

EDP 700—Seminar in Special Education. 3 credits

Prerequisite: Admission limited to special education majors in the Advanced School. Consideration of current problems.

EDP 704—Internship: Special Education. 3 to 9 credits

Prerequisite: Admission limited to special education majors in the Advanced School. Supervised field work in a special education setting appropriate to the student's professional goals. Written application for admission required at least six weeks prior to registration.

EDP 710—Practicum in Individual and Group Counseling. 4 credits

Prerequisites: EDP 615, EDP 619, and written permission from the chairman of the department at least six weeks in advance of registration. Supervised experiences in individual and group counseling in a setting appropriate to the student's professional goals. Students will register for a maximum of 4 credits for each of 3 consecutive quarters.

EDP 715—Seminar in Personnel Work. 5 credits

Admission limited to graduate students in the Advanced School who are near the completion of course work for a degree. Anticipated problems and issues in counseling and guidance, and preparation for leadership in their resolution.

EDP 716—Internship in Personnel Work 1. 5 credits

Prerequisites: EDP 710 and written application for admission to the course is required at least six weeks before registration. Opportunity provided to selected students for supervised field work.

EDP 717—Internship in Personnel Work 2. 5 credits

Continuation of EDP 716.

EDP 718—Internship in Personnel Work 3. 5 credits

Continuation of EDP 717, with emphasis upon the student's responsibility as a consultant or supervisor in counseling and personnel work.

EDP 721—Consultation Procedures. 4 credits

Admission limited to students in the Advanced School. Theory and practice of consultation; the roles of the consultant and consultee; the counselor's function in assisting the professional and allied worker to facilitate personal growth of others.

# EDUCATION—SECONDARY

## GRADUATE FACULTY 1966-67

Durrance, C. L., *Chairman*; Alexander, W. M.; Arnold, L. A.; Bingham, N. E.; Browne, E. B.; Carr, G. D.; Cate, C. A.; Crews, J. W.; Davis, E. A.; Hass, C. G.; Holtan, B. D.; Kidd, K. P.; Kurth, E. L.; McGuire, V.; Moorman, J. H.; Myers, R. B.; Oliva, P. F.; Scrafford, R. A.; Small, D. E.; Timmerman, E.; Wiegman, R. R.; Williams, E. L.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EDS 521—Principles of Business Education. 4 credits
EDS 550—Teaching Mathematics in the Junior High School. 4 credits
EDS 551—Teaching Algebra in the Secondary School. 4 credits
EDS 552—Teaching Geometry in the Secondary School. 4 credits
EDS 560—Teaching Science in the Secondary School. 4 credits
EDS 576—Technical Education Program Development. 4 credits
EDS 580—Teaching in Adult Education Programs. 4 credits
EDS 590—Student Activities in the Secondary School. 4 credits

## GRADUATE COURSES

EDS 601—The Junior High School Curriculum. 4 credits

Prerequisite: ED 600 or consent of instructor. An analysis of the scope and function of the modern junior high school as a school program to meet the needs of early adolescence.

EDS 602—The Secondary School Curriculum. 4 credits

Prerequisite: ED 600 or consent of instructor. An analysis of the scope, function and types of secondary school curricula and ways of improving existing programs.

EDS 603—Community College Education. 4 credits

An analysis of the program and problems of the community college.

EDS 604—Curriculum Development Laboratory. 4 credits

Prerequisite: ED 600. Guided experiences in developing resource units for teaching and the writing of courses of study.

EDS 605—Evaluation in the Secondary School Program. 4 credits

Procedures and techniques of evaluation in secondary schools.

EDS 611—The Core Program in the Secondary School. 4 credits

The organization, methods and materials used in core classes.

EDS 620—Teaching Office Machines. 4 credits

Prerequisite: BEN 352. Functions of machines, their suitabilities for various office functions, and methods of teaching operation of machines commonly used in offices.

EDS 622—Teaching Secretarial Studies. 4 credits
For teachers of business subjects. Curriculum, materials and methods of teaching secretarial subjects.

EDS 623—Teaching Bookkeeping and Consumer Business Subjects. 4 credits
Curriculum, materials, and methods of teaching bookkeeping, economics of business, business law, business arithmetic, economic geography and business correspondence.

EDS 624—Materials and Methods of Teaching General Business. 4 credits
Objectives, content, resource materials, and methods of teaching general business in the junior and senior high schools.

EDS 625—Problems in Business Education. 4 credits
Offered by extension only. Areas of interest of students enrolled will be studied intensively. Problems in business education in Florida schools emphasized.

EDS 628—Seminar and Work Experience in Business Education. 8 credits
Prerequisite: Permission of department. Evaluation of effectiveness of the secondary school business education program in meeting needs of students for beginning office employment. Offered by extension only.

EDS 635—Supervision of Pre-Service Teachers. 4 credits
The function of the directing teacher in the student teaching program and the problems and procedures of supervising the work of student teachers.

EDS 640—Social Studies in the Secondary School. 4 credits
Prerequisite: Preparation in the subject area equivalent to requirements for high school certification, or consent of instructor. Consideration of the problems of teaching social studies.

EDS 641—Economic Education in the Secondary School. 4 credits
A workshop designed (1) to increase understanding of our national economy by a study of fundamental principles and concepts; (2) to make plans for more and better teaching of economic understandings. Offered by extension only.

EDS 650—Mathematics in the Secondary School. 4 credits
Prerequisite: Preparation in subject area equivalent to requirements for high school certification, or consent of instructor. Patterns of mathematics curriculum in the secondary school; practices in teaching mathematics; preparation, selection and use of instructional materials; laboratory experiences in field work as well as in classroom teaching.

EDS 651—Algebra in the Modern Secondary School. 4 credits
Prerequisite: EDS 650 or consent of instructor. A critical analysis of the content and development of algebra with emphasis on implications for teaching in the modern secondary school.

EDS 652—Geometry in the Modern Secondary School. 4 credits
Prerequisite: EDS 650 or consent of instructor. A critical analysis of the content and development of geometry with emphasis on implications for teaching in the modern secondary school.

EDS 660—Science in the Secondary School. 4 credits
Prerequisite: Preparation in subject area equivalent to requirements for high school certification, or consent of instructor. Current problems in teaching science in secondary schools and junior colleges.

EDS 663—The Biological Sciences in the Secondary School. 4 credits
Current practices in teaching biology, the historical and psychological bases

from which they evolved, methods of inquiry and the structure of biology with selected concepts from the newer programs developed by investigatory approaches.

EDS 664—The Physical Sciences in the Secondary School. 4 credits

Current practices in the teaching of the physical sciences, the historical and psychological bases from which they evolved, methods of inquiry, the structure of physics and/or chemistry, with selected concepts from the newer physics and chemistry programs developed by investigatory approaches.

EDS 670—Language Arts in the Secondary School. 4 credits

Prerequisite: Preparation in subject area equivalent to requirements for high school certification, or consent of instructor. Trends, basic principles, methods and materials will be considered.

EDS 675—Cooperative Education. 4 credits

The organization and coordination of diversified cooperative training, distributive education and cooperative business education programs.

EDS 677—Technical Education in the Junior College. 4 credits

An analysis of technical education in modern society, with emphasis upon community junior college programs leading to Associate of Science or similar two-year degrees.

EDS 678—Teaching Technical Education. 4 credits

Prerequisite: Bachelor's degree in a technical area and consent of instructor. Objectives, content, resource materials, evaluation and methods of teaching technical subjects at the post-high school level.

EDS 700—Seminar in Secondary Education. 4 credits

Open to advanced graduate students only, upon consent of the staff of secondary education and the instructor. Critical examination of current research and an overview of the total program in secondary education.

EDS 705—Adult Education in the Community College (Junior College). 4 credits

An examination of the various types of community college programs in adult education. Methods of community survey and ways of identifying and defining educational needs of adults.

EDS 725—Administration and Supervision of Business Education 4 credits

Prerequisite: Two years of teaching experience and approval of the chairman of the department. Problems and duties of administrators and supervisors of business education; departmental organization; rendering services to administrative offices and other school departments.

## EDUCATION—AGRICULTURAL AND EXTENSION

### GRADUATE FACULTY 1966-67

Lofton, W. T., *Chairman*; Christiansen, J. E., Grigsby, S. E.

### GRADUATE COURSES

EDV 611—History and Philosophy of Agricultural Education. 4 credits

Historical developments of agricultural education traced from its beginning in other countries to the present program in the United States with attention to changing philosophies.

EDV 612—The Administration of Vocational Education. 5 credits
Basic principles of administering a program of vocational education on national, state and local levels.

EDV 615—Foundations of Program Planning for Vocational Education. 5 credits
Includes examination of socio-economic forces, school-community relationships, employee-employer relationships, principles, concepts, and practices affecting policy and program planning in vocational education.

EDV 662—Developing Community Programs in Agriculture. 3 credits
Application of basic principles and practices in developing community programs in agriculture at high school and post-high school levels.

EDV 663—Developing Curricular Materials for Programs in Agriculture. 3 credits
The development of appropriate curricular materials for high school and post-high school programs in agriculture; involves preparation of materials by class members.

EDV 665—Problems in Agricultural Education. 2 to 9 credits
For students qualified to select and pursue advanced research problems. May be repeated with change of content up to a maximum of 9 credits.

EDV 667—Supervised Occupational Experiences in Agricultural Education. 4 credits
Basic problems in planning and supervising programs of occupational experiences in view of changes occurring in agricultural occupations.

EDV 671—Adult Education in Agriculture. 5 credits
The establishment, organization of classes, use of appropriate teaching procedures, and evaluation of programs of adult education in agriculture.

EDV 673—The Supervision of Vocational Education. 5 credits
Concepts and supervisory procedures pertaining to the supervision of different facets of local, state, and national programs of vocational education.

EDX 601—Advanced Agricultural Leadership. 3 credits
Advanced training in leadership opportunities and responsibilities in agriculture, including emphasis upon small group leadership, program planning, community organization and development, human relationships, public affairs, and public policy. May be repeated with change of content up to a maximum of 9 credits.

EDX 604—Agricultural and Extension Education Through Group Action. 3 credits
Advanced techniques in developing programs of agricultural and extension education through group action. May be repeated with change of content up to a maximum of 9 credits.

EDX 621—Research in Agricultural and Extension Education. 1 to 4 credits
Prerequisite: Consent of instructor. Library and workshop related to methods in agricultural and extension education, including study of research work, review of publications, and development of written reports. May be repeated with change of content up to a maximum of 9 credits.

# COLLEGE OF ENGINEERING

GENERAL
(Core Courses)

AEROSPACE ENGINEERING

AGRICULTURAL ENGINEERING

BIOENVIRONMENTAL ENGINEERING

CHEMICAL ENGINEERING

CIVIL ENGINEERING

ELECTRICAL ENGINEERING

ENGINEERING SCIENCE AND MECHANICS

INDUSTRIAL AND SYSTEMS ENGINEERING
(Operations Research)

MECHANICAL ENGINEERING

METALLURGICAL AND MATERIALS ENGINEERING

NUCLEAR ENGINEERING SCIENCES

# ENGINEERING—GENERAL

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EGC 541—Tensor Fields and Fluid Dynamics. 3 credits
EGC 578—Nuclear Chemical Engineering. 3 credits

## GRADUATE COURSES

EGC 601—Theory of Fluid Flow 1. 3 credits
The differential equations of motion, continuity and state. Practical solutions for two- and three-dimensional flow.

EGC 602—Theory of Fluid Flow 2. 3 credits
Concepts of velocity potential, stream function and irrotational flow. Application of conformal transformations to two-dimensional flow.

EGC 603—Theory of Fluid Flow 3. 3 credits
Differential equations of motion, continuity, energy and state and their exact and approximate solutions for viscous fluid flow. Laminar and turbulent flows. Introduction to magnetohydrodynamics.

EGC 604—Boundary Layer Theory. 4 credits
Prandtl boundary layer equations. Approximate and exact solutions for multidimensional flows. Laminar, turbulent and thermal boundary layer phenomena. Steady and unsteady state applications.

EGC 605—Theories of Turbulent Flows. 3 credits
Mathematical theory of the turbulent motion of fluids. History of the subject; introduction to contemporary research in the statistical theory of turbulence.

EGC 611—High Speed Gas Dynamics 1. 3 credits
Subsonic flow, linear and nonlinear theories. Hodograph, integral, series and relaxation methods.

EGC 612—High Speed Gas Dynamics 2. 3 credits
Prerequisite: EGC 611. Two-dimensional supersonic flow, method of characteristics. Axially symmetric supersonic flow, linear and nonlinear theories.

EGC 613—High Speed Gas Dynamics 3. 3 credits
Prerequisite: EGC 612. Multidimensional hypersonic flow. Mixed subsonic and supersonic flows. Transonic flow.

EGC 621—Surface Hydrology. 3 credits
Prerequisite: CE 521 or consent of instructor. Occurrence and distribution of water by natural processes, including precipitation, run-off, infiltration, and water losses. Frequency and intensity of storms and floods and effects of reservoirs in reducing them.

EGC 671—Introduction to Plasmas. 3 credits
Prerequisites: PS 305, MS 505. Nomenclature, materials and plasma devices, fundamentals of plasma kinetic theory, low and high pressure discharges, technical applications.

EGC 672—Plasma Theory. 4 credits
Prerequisite: EGC 671. Microscopic and macroscopic foundations of plasma theory. Individual motion of charged particles and macroscopic plasma motion in an electromagnetic field. Nonequilibrium states and relaxation processes. Waves and instabilities.

# AEROSPACE ENGINEERING

## GRADUATE FACULTY 1966-67

CLARKSON, M. H., *Chairman*; ARTHUR, P. D.; HOOVER, J. W.; LEADON, B. M.; MILLSAPS, K. T.; MYERS, O. E.; WILLIAMS, D. T.

General prerequisites are one year of engineering physics or its equivalent, mathematics through differential equations, and an adequate foundation in the general field of engineering, encompassing dynamics, fluid dynamics, thermodynamics, and strength of materials. In addition, permission of instructor is required for each course.

The following *Engineering* CORE *Courses* are available for graduate major credit: EGC 541—Tensor Fields and Fluid Dynamics; EGC 601—Theory of Fluid Flow 1; EGC 602—Theory of Fluid Flow 2; EGC 603—Theory of Fluid Flow 3; EGC 604—Boundary Layer Theory; EGC 605—Theories of Turbulent Flows; EGC 611—High Speed Gas Dynamics 1; EGC 612—High Speed Gas Dynamics 2;— EGC 613—High Speed Gas Dynamics 3; EGC 671—Introduction to Plasmas; EGC 672—Plasma Theory.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ASE 570—PRINCIPLES OF GUIDANCE AND CONTROL. 3 credits

## GRADUATE COURSES

ASE 601—ADVANCED PLASMA TOPICS. 3 credits
Selected topics with application to aeronautics and astronautics.

ASE 602—PROBE TECHNIQUES FOR PLASMA DIAGNOSTICS. 3 credits
Prerequisite: EGC 671. Basic theory of electric and magnetic probes for plasma diagnostics and its practical application to laboratory plasmas.

ASE 611—THE DYNAMICS OF REAL GASES 1. 3 credits
The theoretical basis of high energy gas dynamics reviewed and applied to reacting ionizing and radiating flows.

ASE 612—THE DYNAMICS OF REAL GASES 2. 3 credits
Continuation of ASE 611.

ASE 613—THE DYNAMICS OF REAL GASES 3. 3 credits
Continuation of ASE 612.

ASE 631—ADVANCED AEROSPACE STRUCTURES 1. 3 credits
Steady state aeroelastic and structural problems. Flutter analysis. Transient loads, nonstationary and oscillating airfoil theory.

ASE 632—ADVANCED AEROSPACE STRUCTURES 2. 3 credits
Continuation of ASE 631.

ASE 633—ADVANCED AEROSPACE STRUCTURES 3. 3 credits
Continuation of ASE 632.

ASE 650—PHYSIOLOGICAL ASPECTS OF ATMOSPHERIC AND SPACE FLIGHT. 3 credits
The physiological and psychological factors which influence design considerations for manned aircraft and spacecraft.

ASE 661—Astronautical Mechanics 1. 3 credits
General laws of mechanics of particles and rigid bodies. Newtonian orbits; theory of gyroscopes. General transformation theory; Hamilton-Jacobi equations.

ASE 662—Astronautical Mechanics 2. 3 credits
Prerequisite: ASE 661. Small oscillations. Perturbation theory; methods of celestial mechanics. Numerical methods of orbit computation.

ASE 663—Astronautical Mechanics 3. 3 credits
Prerequisite: ASE 662. Lunar theory; orbits about an oblate spheroid; tumbling of an orbiting vehicle. The atmospheric entry problem.

ASE 670—Control Techniques in Aerospace Systems. 3 credits
Prerequisites: ASE 570, EE 474. Stability criteria. Techniques of feedback control with applications to aerospace systems. Use of computers in control system design.

ASE 671—Advanced Space Instrumentation Laboratory. 1 to 9 credits
A series of advanced laboratory experiments relating to instrumentation of space vehicles. Emphasis is on the scientific principles of instruments used or to be modified for space missions. May be repeated with change of content up to a maximum of 9 credits.

ASE 681—Advanced Aerospace Design. 1 to 9 credits
Advanced aerospace design projects. May be repeated with change of content up to a maximum of 15 credits.

ASE 684—Aerospace Research. 1 to 9 credits
May be repeated with change of content up to a maximum of 15 credits.

ASE 691—Special Topics in Aerospace Engineering. 1 to 9 credits
Laboratory, lectures or conferences covering specially selected topics in aerospace engineering. May be repeated with change of content up to a maximum of 15 credits.

ASE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ASE 799—Doctoral Research. 1 to 12 credits

# AGRICULTURAL ENGINEERING

## GRADUATE FACULTY 1966-67

Kinard, D. T., *Chairman*; Beeman, J. F.; Choate, R. E.; Fluck, R. C.; Myers, J. M.; Ross, I. J.; Skinner, T. C.

*Prerequisite* for admission to graduate study in agricultural engineering is a bachelor's degree from a curriculum essentially equivalent to the undergraduate curriculum in agricultural engineering at the University of Florida. Students planning to take graduate work in this field should consult departmental advisers prior to registration.

Candidates for the master's degree normally will be required to take AGE 601, AGE 602, and AGE 603 and at least one course from the list AGE 670, AGE 671, AGE 672, AGE 673, or AGE 674, in addition to the thesis. Prerequisite for admission to any of the following courses is the approval of the instructor.

## GRADUATE COURSES

AGE 601—Seminar. 1 credit
Discussions on research and current trends and practices in agricultural engineering.

AGE 602—Research Methods in Agricultural Engineering. 3 credits
Research techniques and methods used in agricultural engineering.

AGE 603—Instrumentation in Agricultural Engineering Research. 4 credits
The principles and application of measuring instruments and devices for obtaining experimental data in agricultural engineering research.

AGE 670—Non-Thesis Research in Agricultural Engineering. 0 to 5 credits
Special problems in agricultural engineering. May be repeated with change of content up to a maximum of 10 credits.

AGE 671—Advanced Soil and Water Management Engineering. 4 credits
Analysis and solution of selected problems dealing with land improvement and the control and use of water for agricultural production.

AGE 672—Advanced Farm Machinery. 4 credits
Analysis of agricultural machines, power units and mechanized systems with emphasis on functional design requirements; evaluation of performance of those machines and systems.

AGE 673—Advanced Farm Buildings. 4 credits
Analysis of selected problems dealing with design criteria for farm structures, particularly as related to efficient production systems.

AGE 674—Advanced Agricultural Process Engineering. 4 credits
Analytical study of engineering problems dealing with the handling and processing of agricultural products.

AGE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# BIOENVIRONMENTAL ENGINEERING

## GRADUATE FACULTY 1966-67

Kiker, J. E., Jr., *Chairman*; Bevis, H. A.; Black, A. P.; Danis, A. L.; Dunavant, B. G.; Furman, T. deS.; Harding, C. I.; Henderickson, E. R.; McCaldin, R. O.; Moreau, D. H.; Morgan, W. H.; Putman, H. D.; Pyatt, E. E.; Schaake, J. C., Jr.; Sholtes, R. S.; Stewart, R. E.

Graduate study is offered leading to the degrees of Master of Environmental Engineering Science, Master of Science in Engineering, and Doctor of Philosophy. Areas in which the student may specialize include air resources, water supply and water pollution control, water resources planning by systems analysis, radiation hygiene and hazard control, aquatic biology, water chemistry and biomedical engineering.

*Prerequisites* to graduate training in environmental engineering sciences include a bachelor's degree in engineering or in a basic science such as chemistry, physics, biology or bacteriology. Holders of a degree in engineering may normally complete the requirements for a master's degree in one calendar year; others may require a longer period of time depending upon the amount of background work to be made up. The specific program for each student must be approved by his supervisory committee.

The following *Engineering Core Course* is available for graduate major credit: EGC 621—Surface Hydrology.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

BEE 500—Biological Waste Treatment. 3 credits

BEE 501—Unit Operations of Bioenvironmental Engineering. 3 credits

BEE 502—Industrial Waste Treatment. 3 credits

BEE 510—Bioenvironmental Engineering Laboratory 1. 3 credits

BEE 511—Bioenvironmental Engineering Laboratory 2. 3 credits

BEE 522—Environmental Engineering. 3 credits

BEE 535—Industrial Water Treatment. 3 credits

## GRADUATE COURSES

BEE 600—Advanced Sanitary Engineering Design 1. 3 credits

Prerequisites: CE 450, CE 451, CE 452. Complete problems in the layout and design of water distribution systems, sewage collection systems, pumping stations and force mains.

BEE 601—Advanced Sanitary Engineering Design 2. 3 credits

Prerequisite: BEE 501. Complete problems in design and layout of water treatment plants, waste water treatment plants and methods of effluent disposal.

BEE 602—Advanced Sanitary Engineering Design 3. 3 credits

Prerequisite: BEE 601. Continuation of BEE 601 with specific emphasis on cost, financing and operation.

BEE 603—Water Quality Management. 3 credits

Prerequisite: BEE 501 or consent of instructor. Principles of water quality management applied to streams, lakes and tidal estuaries and embayments. Influence and effects of municipal and industrial wastes on public water supplies, shellfish, storage, recreational uses, industrial uses and wildlife.

BEE 615—Analysis of Water Resources Projects. 3 credits

Prerequisite: Consent of instructor. The roles of state and federal agencies in water resources planning and development with emphasis on project justification and concomitant legal constraints.

BEE 616—Urban Environmental Problems. 1 to 3 credits

Prerequisites: CE 450, CE 451, CE 452, consent of instructor. Approved problems for study or research selected from any field of urban environmental engineering. May be repeated with change of content up to a maximum of 3 credits.

BEE 625—Microbiology of Waste Treatment. 3 credits

Prerequisites: CE 450, CE 451, CE 452. Systematics and ecological relationships of microorganisms, including bacteria, fungi and protozoa, in various waste treatment processes.

BEE 626—Aquatic Microbiology. 3 credits

Prerequisite: BEE 625 or consent of instructor. The role of microorganisms in fresh and marine waters which receive waste effluents or are used as public water supplies. Emphasis on phytoplankton.

BEE 627—Biology of Aquatic Systems. 3 credits

A survey of macroscopic plant and animal forms which may serve as indicators of water quality in streams and lakes.

BEE 636—Water Supply and Treatment 1. 3 credits

A survey of Florida hydrology and discussion of the most recent developments in treatment and stabilization of municipal and industrial water supplies.

BEE 637—Water Supply and Treatment 2. 3 credits

Continuation of BEE 636.

BEE 640—Radiological Health. 3 credits
Prerequisites: PS 440, consent of instructor. Introduction to nuclear radiation. Special problems in environmental engineering resulting from nuclear radiation. Sources of radiation exposure. Assessment and control of environmental hazards.

BEE 641—Radiological Techniques. 4 credits
Prerequisite: BEE 640 or consent of instructor. Application of radiological techniques to environmental engineering. Theory and operation of the principal detection instruments. Laboratory experiments on measurement and control of radioisotopes in the environment.

BEE 642—Radioactive Wastes. 5 credits
Prerequisites: BEE 501, BEE 640, consent of instructor. The source, treatment and disposal of radioactive wastes. Emphasis on prevention of environmental contamination.

BEE 650—Occupational Health. 4 credits
Prerequisite: BEE 668. The effects, assessment and control of physical and chemical factors in man's working environment, including chemical agents, electromagnetic radiation, temperature, humidity, pressure, illumination, noise and vibration.

BEE 651—Atmospheric Pollution. 3 credits
The atmosphere as a place of disposal for industrial and community effluents. Effects of air pollution, classification of wastes, evaluation of data.

BEE 652—Fundamentals of Environmental Instrumentation. 3 credits
Basic instrument components with emphasis on those commonly used in the environmental engineering field.

BEE 653—Application of Environmental Instrumentation. 3 credits
Prerequisite: BEE 652 or consent of instructor. Assembly of components into a successful instrumentation system to accomplish stated objectives. Introduction to data telemetry systems and automatic data processing.

BEE 654—Air Pollution Sampling and Analysis. 3 credits
Theory and practice of sampling. Study of the theory and methods for determining the concentration of biological, chemical and radiological pollutants.

BEE 655—Air Pollution Control Measures. 3 credits
Theory and application of equipment and methods for control of pollution due to airborne materials.

BEE 656—Micrometeorology of Pollutant Dispersion 1. 3 credits
Meteorology and the physics of the atmosphere as they affect dispersion of gases and aerosols. Diffusion theories, mathematical modeling and empirical approaches. Meteorological techniques and their use in air pollution problems.

BEE 657—Micrometeorology of Pollutant Dispersion 2. 3 credits
Continuation of BEE 656.

BEE 658—Contamination Control. 3 credits
Engineering principles of contamination control, including design, operation and monitoring. Emphasizes manufacturing facilities, but control in hospitals and related areas is also treated in detail.

BEE 668—Man and His Environment. 5 credits
Prerequisite: Consent of instructor. The elements of human physiology, toxicology and epidemiology as they influence the work of the engineer in environmental health. Those areas emphasized through which man is affected by contact with air, water and food.

BEE 670—Graduate Environmental Engineering Seminar. 0 to 3 credits
Discussions and reports pertaining to the literature and developments in the field.

BEE 671—Advanced Envionmental Engineering Practice 1. 1 to 5 credits
Special problems in the application of sanitary examinations of water, milk, food, wastes and air. Field exercises demonstrating principles of water and waste treatment, and advanced problems in interpretation of laboratory results. May be repeated with change of content up to a maximum of 5 credits.

BEE 672—Advanced Environmental Engineering Practice 2. 1 to 5 credits
Continuation of BEE 671. May be repeated with change of content up to a maximum of 5 credits.

BEE 676—Bioenvironmental Engineering. 3 credits
Prerequisite: BEE 522 or consent of instructor. Various integrants of public health engineering with emphasis on selected problems to meet the needs of professional engineers practicing in public health or dealing with health agencies.

BEE 680—Solid Wastes. 3 credits
Quantities and characteristics of municipal refuse. Collection methods, equipment and costs. Refuse disposal practices. Regional planning and management.

BEE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

BEE 799—Doctoral Research. 1 to 12 credits

# CHEMICAL ENGINEERING

## GRADUATE FACULTY 1966-67

Fahien, R. W., *Chairman*; Bennett, R. B.; Block, S. S.; Gubbins, K. E.; Kirmse, D. W.; Mahoney, J. F.; May, F. P.; Nolan, W. J.; O'Connell, J. P.; Randolph, A. D.; Reed, T. M.; Reed, X. B.; Schweyer, H. E.; Simons, J. H.; Tyner, M.; Walker, R. D., Jr.; Welch, A. P.

Graduate work for the Ph.D. and M.S.E. degrees in chemical engineering emphasizes these areas: (1) Chemical Engineering Science—transport phenomena, fluid dynamics, thermodynamics, kinetics, microstructure of matter and materials science; (2) Chemical Engineering Systems—chemical reaction engineering, process control, process dynamics, optimization, separations processes; and (3) Interdisciplinary Chemical Engineering—energy conversion and fuel cells, polymer science, microelectronics, process economics, biofluid mechanics and bioengineering.

Beyond the Graduate School requirements, admission to graduate work in chemical engineering depends upon the qualifications of the student, whose record and recommendations are carefully and individually studied. During registration week each graduate student registering for the first time is counseled to develop an initial study program best suited for his needs and based on a comprehensive one-day examination covering the field of chemical engineering. This examination has no effect on the student's admission status, but the results are utilized by the Graduate Committee to guide the student. As a consequence, his program may include some undergraduate courses, if such action is necessary to better prepare him for graduate course work.

It is expected that all new graduate students will become proficient in both analog and digital computer programming during their first quarter on campus.

The following *Engineering Core Courses* are available for graduate major credit: EGC 541—Tensor Fields and Fluid Dynamics; EGC 578—Nuclear Chemical Engineering; EGC 601—Theory of Fluid Flow 1; EGC 602—Theory of Fluid Flow 2; EGC 603—Theory of Fluid Flow 3; EGC 604—Boundary Layer Theory; EGC 605—Theories of Turbulent Flows; EGC 611—High Speed Gas Dynamics 1; EGC 612—High Speed Gas Dynamics 2; EGC 613—High Speed Gas Dynamics 3; EGC 671—Introduction to Plasmas; EGC 672—Plasma Theory.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

CHE 503—Mathematical Methods in Chemical Engineering. 3 credits

CHE 512—Process Systems Laboratory. 3 credits

CHE 547—Electrochemical Engineering. 3 credits

CHE 551—Polymeric Materials. 3 credits

CHE 573—Organic Chemical Processing. 3 credits

CHE 576—Process Economics. 3 credits

## GRADUATE COURSES

CHE 601—Graduate Seminar. 1 credit

Required regularly of all graduate students.

CHE 603—Models and Methods. 3 credits

Prerequisite: MS 304. Mathematical modeling and application to engineering problems of ordinary and partial differential equations, operational calculus, digital and analog computation techniques, complex variables and integral equations.

CHE 604—Multidimensional and Discrete Systems. 3 credits

Prerequisite: CHE 603. Applications of the mathematics of multidimensional and discrete systems to engineering problems. Matrix methods. Calculus of finite differences. Linear programming.

CHE 605—Applied Field Theory. 3 credits

Prerequisite: MS 502. Field equations of heat, mass and momentum transport and of electromagnetic theory in orthogonal and non-orthogonal Euclidean and non-Euclidean geometries. Covariant and convective differentiation of tensors. Surface geometries. Applications of LaPlace, Helmholtz, diffusion and wave equations.

CHE 606—Applied Statistics and Probabilistic Systems. 3 credits

Prerequisite: CHE 603. Applications of random variables and probability distributions; stochastic models, Monte Carlo techniques; statistical inference, sampling distributions, tests of significance, and experimental design.

CHE 610—Process Dynamics 1. 3 credits

Prerequisite: CHE 411. Corequisite: CHE 503 or CHE 603. The dynamics and control of chemical processing systems with emphasis on the dynamics of the unit operations and chemical reactions. Analog simulation of chemical processing systems.

CHE 611—Process Dynamics 2. 3 credits

Continuation of CHE 610.

CHE 614—Computer Control of Processes. 3 credits

Prerequisite: CHE 616 or consent of instructor. The application of computers

to control of chemical processes, including the practical work involved in planning, organizing, managing and executing a computer control project.

CHE 615—Optimization Techniques. 3 credits

Prerequisite: CHE 503 or CHE 603. Introduction to optimization techniques used in chemical process operations, process control, and systems engineering.

CHE 616—Process Systems Optimization. 3 credits

Prerequisite: CHE 615. Optimization of chemical processes and systems with particular emphasis on dynamic programming and the maximum principle.

CHE 617—Process Systems Engineering. 3 credits

Prerequisite: CHE 411. Applications of principles of systems engineering to the study of complex chemical processing systems.

CHE 621—Chemical Engineering Kinetics. 3 credits

Concepts and methods of chemical kinetics useful in the design of chemical reactors; molecular collision theory, transition theory, homogeneous and heterogeneous reactions in gas, liquid and solid phase with energy and mass transfer.

CHE 622—Reactor Design and Optimization. 3 credits

Application of principle of chemical kinetics to the design of batch, tubular flow and tank flow reactors for optimum conditions.

CHE 626—Transport Properties and Irreversible Thermodynamics. 3 credits

Prerequisites: CHE 613, CHE 632. Molecular models and statistical mechanical methods useful in the prediction and correlation of viscosity, diffusivity and thermal conductivity of fluids. Boltzmann equation, radial distribution function, cell models, absolute rate theory, corresponding states principle.

CHE 631—Thermodynamics of Reaction and Phase Equilibria. 3 credits

Methods for treating chemical and phase equilibria in multi-component systems through the application of thermodynamics and molecular theory.

CHE 632—Applied Statistical Mechanics. 3 credits

The methods of wave mechanics and statistical mechanics and their usefulness in engineering problems.

CHE 633—Statistical Thermodynamics. 3 credits

The use of statistical mechanics to describe, predict and correlate thermodynamic properties of compounds and mixtures.

CHE 641—Fundamental Transport Phenomena. 3 credits

Prerequisite: CHE 343. Tensor field equations for the transport of heat, mass and momentum. Flux equations for laminar flow and solids. Application of macroscopic balances.

CHE 642—Interfacial Transport Phenomena. 3 credits

Transport of heat, mass and momentum at interfaces. Heat and mass transfer coefficients, drag coefficient and friction factor. Boundary layer theory.

CHE 643—Turbulent Transport Phenomena. 3 credits

Prerequisite: CHE 641. Statistical theory of turbulence; correlation coefficients, energy spectra, isotropy and homogeneity, eddy diffusivity and viscosity tensors. Boundary layer theory.

CHE 645—Rheology. 3 credits

Analysis and characterization of rheological systems.

CHE 646—Non-Newtonian Fluid Dynamics. 3 credits

Prerequisite: CHE 642. Constitutive equations for non-Newtonian fluids (including viscoelastic substances) such as polymers, plastics, paints and slurries.

CHE 647—Chemical Energy Conversion. 3 credits
Prerequisite: CHE 641. The principles of thermodynamics and transport phenomena applied to the analysis and design of chemical energy conversion devices.

CHE 648—Particulate Systems. 3 credits
Prerequisite: MS 304. Dynamics of fluid-solid, fluid-fluid and biological systems; generalized population balances, macroscopic particle balance, kinetics of particle growth, birth and death functions, particle size determination. Crystallization, filtration, aerosols, entrainment, free molecule flow and fluidized reactors.

CHE 649—Applied Fluid Dynamics. 3 credits
The basic equations of fluid dynamics applied to chemical engineering problems in fluid-solid and fluid-fluid systems; low Reynold's number and particulate system fluid dynamics; physiochemical hydrodynamics.

CHE 650—Engineering Properties of Organic Materials. 3 credits
Prerequisite: CHE 551 or consent of instructor. Theoretical studies in molecular science. Correlation of composition, microstructure and morphology of organic materials with macroscopic engineering properties.

CHE 651—Macromolecular Materials. 3 credits
Formation, structure and properties of macromolecules. Physical and chemical properties of these materials. Polymerization and processing methods. Commercial techniques in forming. Applications.

CHE 662—Mass Transfer Operations. 3 credits
The process design of equipment for mass transfer operations based on performance and economic optima.

CHE 663—Heat Transfer Operations. 3 credits
The process design of equipment for heat transfer operation based on performance and economic optima.

CHE 665—Stagewise Separations Processes. 3 credits
Theory, design and evaluation of staged separation processes such as distillation columns, extractors and absorbers. Multicomponent-multistage distributions using rigorous digital computer computational methods. Real-time modeling for process automation.

CHE 671—Process Engineering. 3 credits
Application of chemical engineering operations and processing to industrial operations, such as petroleum refinery, manufacture of phosphates and fertilizers and paper pulp processing.

CHE 672—Process Equipment Design. 3 credits
Unit operations with emphasis on detailed design of equipment to perform the service required, considering capacity, materials, equipment and economics.

CHE 673—Process and Plant Design. 3 credits
Prerequisite: Consent of instructor. Advanced techniques used in the design of various complex chemical processes and plants.

CHE 676—Process Economy Analysis. 3 credits
Prerequisite: CHE 576. Economics in design and operation of chemical engineering equipment. Analysis for decision under conditions of certainty and uncertainty with applications of queuing, Monte Carlo, Markov processes, and geometric and dynamic programming.

CHE 677—Biochemical Engineering. 3 credits

Physical and chemical pecularities of living organisms and their products. Material and energy transfer in living systems, unit operations in biological processes and industrial biochemical engineering processes.

CHE 680—Advanced Seminar in Chemical Engineering. 2 credits
Discussions of research and current literature in chemical engineering. May be repeated with change of content up to a maximum of 6 credits.

CHE 681—Advanced Seminar in Process Control. 2 credits
Prerequisites: CHE 610, CHE 611. Discussions of research and current problems in process control. May be repeated with change of content up to a maximum of 6 credits.

CHE 682—Advanced Seminar in Transport Phenomena. 2 credits
Prerequisites: CHE 641, CHE 642. Discussions of research and current literature in transport phenomena. May be repeated with change of content up to a maximum of 6 credits.

CHE 683—Advanced Seminar in Thermodynamics. 2 credits
Prerequisites: CHE 631, CHE 632. Discussion of research and current literature in thermodynamics. May be repeated with change of content up to a maximum of 6 credits.

CHE 685—Advances in Separations Processes. 3 credits
Prerequisites: CHE 453, CHE 665. Selected advanced topics in separations processes such as thermal diffusion, molecular distillation, fractional crystallization, adsorption fractionation, and zone refining.

CHE 686—Advances in Process Systems Engineering. 3 credits
Prerequisite: CHE 617.

CHE 687—Advances in Numerical and Analytical Computtation. 3 credits
Prerequisites: CHE 603, CHE 604. Applications of advanced numerical and analytical techniques such as iterative matrix methods, hybrid computation, direct vector methods, functional analysis and adaptive models.

CHE 690—Special Topics in Chemical Engineering 1. 1 to 6 credits
Lectures on separations processes, reactor design, applied molecular and kinetic theory, thermodynamics, particulate systems, properties of chemical substances, transport phenomena, non-Newtonian fluid dynamics, turbulence, applied mathematics, computer science, biochemical engineering, electrochemical engineering. CHE 690, CHE 691, CHE 692 may be repeated with change of content, but no more than 12 credits can be received for any combination of these three.

CHE 691—Special Topics in Chemical Engineering 2. 1 to 6 credits
Continuation of CHE 690.

CHE 692—Special Topics in Chemical Engineering 3. 1 to 6 credits
Continuation of CHE 691.

CHE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

CHE 799—Doctoral Research. 1 to 12 credits

# CIVIL ENGINEERING

## GRADUATE FACULTY 1966-67

Kluge, R. W., *Chairman*; Christensen, B. A.; Grantham, W. J., Jr.; Sawyer, H. A., Jr.; Schmertmann, J. H.; Self, M. W.; Spangler, B. D.; Zimpfer, W. H.

For the Master of Science in Engineering degree, and for the Master of Engineering degree, graduate students may pursue major work in highway, structural, hydraulic, coastal, soil mechanics and foundations or a combination

thereof. A student electing to pursue a program leading to the Master of Engineering degree, which involves such areas of study as highways, hydraulics, soil mechanics and structures, must prepare and orally present a technical paper of substantial engineering significance before a Civil Engineering departmental seminar sometime during his period of academic residence. He may receive up to 3 credits for this activity, but they are in addition to the minimum credits required for the degree. Minor work may be taken in engineering mechanics, mathematics, or in other basic sciences related to the field of study.

Graduate work leading to the Ph.D. in Civil Engineering may be taken in the major areas of hydraulic engineering, soil mechanics, foundations and structural engineering. Minor work is usually taken in mathematics and engineering mechanics. The specific program of study is prepared in consultation with the student and arranged according to his need and particular interest.

The following *Engineering Core Courses* are available for graduate major credit: EGC 541—Tensor Fields and Dynamics; EGC 621—Surface Hydrology.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

CE 510—Highway Design. 3 credits
CE 511—Traffic Engineering. 3 credits
CE 520—Problems in Hydraulics. 3 credits
CE 521—Geohydrology 3 credits
CE 522—Open-Channel Hydraulics 1. 3 credits
CE 525—Hydraulic Motors and Pumps. 3 credits
CE 560—Stress-Deformation Analysis of Soil Media. 3 credits
CE 561—Soil Exploration for Engineering Design. 3 credits
CE 570—Design in Prestressed Concrete. 3 credits
CE 571—Planning and Design of Industrial Buildings. 3 credits
CE 572—Design of Highway Bridges. 3 credits
CE 573—Design of Structural Systems. 3 credits
CE 590—Computer Methods in Civil Engineering. 3 credits

## GRADUATE COURSES

CE 610—Advanced Highway Engineering. 3 or 6 credits
Prerequisite: CE 410. Special topics in highway soil engineering, behavior of granular and stabilized highway materials, advanced pavement design, highway capacity and highway planning.

CE 620—Groundwater Hydraulics. 3 credits
Prerequisite: CE 521 or consent of instructor. Laminar flow through porous isotropic and anisotropic media. Two-dimensional flow problems and potential theory methods. Three-dimensional flow. Multiple phase flow. Salt water intrusion. Dispersion. Turbulent ground-water flow. Transient flow.

CE 622—Open-Channel Hydraulics 2. 3 credits
Prerequisite: CE 522 or consent of instructor. Unsteady open channel flow. Equation of motion. The method of characteristics. Surge formation. Dam-break problem. Flood waves. Rating curves and expressions for discharge.

CE 623—Sediment Transport. 3 credits
Prerequisite: CE 522 or consent of instructor. Alluvial water courses. Critical shear stress and stable channels. Modes of sediment motion and bed formation. Suspended load. Bed-load formulas and entrainment at the bed. Transport in closed conduits. Natural rivers. Meanders.

CE 624—Hydraulic Models and Analogs. 3 credits
Prerequisite: CE 420 or consent of instructor. Principles of hydraulic similitude. Special model laws and their limitations. Dimensional analysis. Distorted models with fixed or movable bed. Calibration of models; interpretation of model results. Electrical and laminar flow analogs. Applications.

CE 625—Hydraulic Measurements in Laboratory and Field. 3 credits
Prerequisite: CE 420 or consent of instructor. The modern hydraulic laboratory. Flumes and test rigs. Advanced methods for measurement of head, velocity, discharge, sediment transport, etc. Auxiliary electronic equipment.

CE 626—Advanced Hydraulic Problems. Variable credit
Prerequisites: CE 520, CE 521, or consent of instructor. Advanced analysis and design problems in hydraulics and hydraulic engineering. May be repeated with change of content up to a maximum of 9 credits.

CE 627—Hydraulic Transients. 3 credits
Prerequisite: CE 420 or consent of instructor. Unsteady pipe flow. The surge tank. Waterhammer analysis. Numerical and graphical methods. Digital programming of unsteady flow situations.

CE 631—Coastal Hydraulics 1. 3 credits
Prerequisite: CE 420 or consent of instructor. Short waves: wave generation, linear theory, shoaling, refraction, diffraction, wave spectra, wave forces on structures.

CE 632—Coastal Hydraulics 2. 3 credits
Prerequisite: CE 420 or consent of instructor. Long waves: surges, tsunamis, flood routing, method of characteristics, numerical solutions.

CE 633—Coastal Hydraulics 3. 3 credits
Prerequisite: CE 420 or consent of instructor. Tides: origin of the tide, tidal computations.

CE 634—Coastal Sediment Transport. 3 credits
Prerequisites: CE 623, CE 631. Principles of sand transport by waves, littoral drift, sediment transport in tidal channels and tidal basins.

CE 635—Harbor Hydraulics. 3 credits
Prerequisite: CE 631. Wave action in harbors including seiches. Response of a ship to waves and flow; squat, pitch, roll. Sediment transport in tidal channels and tidal basins.

CE 636—Harbors 1. 3 credits
Prerequisite: CE 635. Layout of harbor entrances, design of breakwaters.

CE 637—Harbors 2. 3 credits
Prerequisite: Consent of instructor. Harbor equipment, port planning, port management, dock and mooring facilities, cargo handling.

CE 640—Rheological Response of Bituminous Materials. 3 credits
Prerequisites: CE 410 and consent of instructor. Engineering analysis of deformation mechanisms for asphalt and asphalt-aggregate systems.

CE 641—Advanced Metal Structures. 3 credits
Prerequisite: Consent of instructor. The behavior of structural materials under static, dynamic and repeated loads. Effects of temperature. Materials problems in structural design.

CE 660—Advanced Soil Mechanics. 3 to 9 credits
Prerequisite: CE 460. Special problems in the application of soil mechanics to the design and construction of buildings, foundations, earth structures and highways. May be repeated with change of content up to a maximum of 9 credits.

CE 661—Advanced Foundations 3 or 6 credits

Prerequisites: CE 461, CE 672, CE 660 or consent of instructor. Study of special foundations using the most recent information from soil mechanics and structural analysis. Treatment of pile foundations, mats, retaining walls and structures such as piers. May be repeated with change of content up to a maximum of 6 credits.

CE 662—Structure and Engineering Properties of Soils. 3 to 9 credits

Prerequisite: Consent of instructor. Factors influencing mechanical properties of soils; effective stress, cohesion and friction, shear-consolidation interaction, pore pressures, creep and dynamic effects. Emphasis on research and laboratory instruction. May be repeated with change of content up to a maximum of 9 credits.

CE 663—Soil Dynamics. 3 credits

Prerequisite: Consent of instructor. Review of dynamic principles; lumped systems; phase plane solution; elastic half-space theory; soil behavior under dynamic loading; foundation design problems under impulse, earthquake, pavement and steady state vibrations.

CE 664—Special Studies in Soil Engineering. 1 to 6 credits

Prerequisite: Consent of instructor. Analytic or laboratory studies of advanced topics in theoretical or applied soil mechanics. Emphasis on special interests of students. May be repeated with change of content up to a maximum of 6 credits.

CE 670—Topics in Structural Dynamics. 3 to 6 credits

Prerequisite: CE 674 or consent of instructor. Analysis and design studies in selected topics such as cable-supported structures, thin shell roofs and tanks. May be repeated with change of content up to a maximum of 6 credits.

CE 671—Advanced Reinforced Concrete. 3 to 6 credits

Prerequisite: CE 474. Study of research in reinforced concrete, particularly in connection with development of building code requirements; ultimate load theories and their application to design; special design problems. May be repeated with change of content up to a maximum of 6 credits.

CE 672—Analysis of Statically Indeterminate Structures. 3 or 5 credits

Prerequisites: CE 371, CE 372. Frames with variable moment of inertia; arch and ring analysis by elastic center and column analogy; matrix solutions; redundant trusses; moment and shear distribution. May be repeated with change of content up to a maximum of 5 credits.

CE 673—Advanced Structural Laboratory. 3 credits

Prerequisites: CE 371, CE 372. Model studies and analysis. Applications to static and dynamic loadings. Mechanics of similitude and dimensional analysis. Vibration of beams; research studies.

CE 674—Advanced Structural Analysis. 3 to 6 credits

Prerequisites: CE 371, CE 372, ESM 302. Approximate methods of analysis for structural members of variable section modulus, including problems on vibrations, column buckling, beam-columns and beams on elastic supports. May be repeated with change of content up to a maximum of 6 credits.

CE 675—Advanced Structural Problems. 1 to 9 credits

Prerequisite: Consent of instructor. Analytic and laboratory studies of selected topics in structural engineering. May be repeated with change of content up to a maximum of 9 credits.

CE 676—Design of Framed Structures. 3 to 6 credits
Prerequisites: CE 671, CE 672. Design of continuous trusses; secondary stresses; design of rigid frames, multi-story frames and arches. May be repeated with change of content up to a maximum of 6 credits.

CE 677—Design of Folded Plates and Shells. 3 to 6 credits
Prerequisites: CE 671, CE 672. Analysis and design of folded plate, shell, tank and cable-supported structures. May be repeated with change of content up to a maximum of 6 credits.

CE 679—Nonlinear Structural Analysis and Design. 3 to 9 credits
Prerequisite: CE 672 or consent of instructor. Rigid-plastic and multi-linear analysis and design of beams and frames. Yield line theory of slabs. Deflection analyses of columns, frames, curved compression members and suspension systems, with design applications. May be repeated with change of content up to a maximum of 9 credits.

CE 680—Advanced Prestressed Concrete Design. 3 credits
Prerequisites: CE 474, CE 570. Design of prestressed concrete structural systems including continuous beams, slabs, frames and composite members. Limit analysis of prestressed concrete structures. Design of prestressed concrete reservoirs. Special topics related to prestressed concrete structural systems in building construction, foundations and harbors.

CE 690—Matrix Methods in Structural Analysis. 3 or 6 credits
Prerequisite: Consent of instructor. Review of matrix algebra as it relates to structural analysis. Development of matrix-method solutions for both trusses and rigid frames. Problems programmed for the digital computer. May be repeated with change of content up to a maximum of 6 credits.

CE 691—Graduate Civil Engineering Seminar. 0 to 3 credits
Discussions and reports pertaining to literature and developments in civil engineering. May be repeated with change of content up to a maximum of 3 credits.

CE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

CE 799—Doctoral Research. 1 to 12 credits

# ELECTRICAL ENGINEERING

## GRADUATE FACULTY 1966-67

Chen, W. H., *Chairman*; Bailey, T. L.; Bittman, L. R.; Broderson, A. J.; Childers, D. G.; Donaldson, M. R.; Durling, A. E.; Elgerd, O. I.; Fagen, W. F.; George, T. S.; Hummer, J. L.; Johnson, R. C., Jr.; Latour, M. H.; Lindholm, F. A.; Manders, A. M.; Mathews, B. E.; O'Malley, J. R.; Paige, A.; Ramey, R. A.; Rosier, N. E.; Sage, A. P.; Sah, C. T. (Lecturer); Sashoff, S. P.; Shaffer, C. V.; Simons, F. O.; Skellett, A. M.; Smith, J. R.; Sutherland, A. D.; Walker, R. L.; Walter, W. A.; Watson, J. K.; Wing, A. H.

*Prerequisites:* A college course in physics, differential and integral calculus, differential equations with Laplace transform emphasis, and a minimum of 54 credits, or the equivalent, in courses in the general field of electrical engineering, together with special prerequisites stated for individual courses.

To help formulate a Ph.D. program, the Department of Electrical Engineering gives a preliminary counseling examination over the basic undergraduate subjects and some of the graduate subjects already taken by the student. This

examination will be administered by a departmental committee and will be given, in general, during the first fall or spring quarter of attendance after the completion of the master's program.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

EE 510—Geometric Optics for Engineers. 3 credits
EE 521—Fundamentals of Modern Electronic Engineering. 3 credits
EE 522—Transistor Electronics. 3 credits
EE 523—Transistor Electronics Laboratory. 1 credit
EE 524—Pulse Circuits Laboratory. 1 credit
EE 525—Electronic Switching and Shaping Circuits. 3 credits
EE 526—Applications of Pulse Circuits. 3 credits
EE 527—Microelectronics. 4 credits
EE 551—Antenna Systems. 3 credits
EE 555—Microwave Laboratory. 1 credit
EE 556—Microwave Techniques. 4 credits
EE 561—Digital Computer Principles. 3 credits
EE 581—Power System Instrumentation. 3 credits
EE 591—Special Topics in Electrical Engineering. 1.
1 to 4 credits. Maximum 12 credits including EE 592
EE 592—Special Topics in Electrical Engineering 2.
1 to 4 credits. Maximum 12 credits including EE 591

## GRADUATE COURSES

EE 600—Elements of Linear Systems. 3 credits
Introduction to the theory of linear systems. Fourier, Laplace and Z-transform theory for periodic, aperiodic and discrete signals in linear systems. Sampling theorems. Convolution, impulse response, transfer functions. Stability, causality, state variables.

EE 601—Advanced System Theory 1. 3 credits
Prerequisite: EE 600 or EE 630. Matrix theory required for the study of complex linearized dynamic systems and electric networks; stability theory; illustrative examples.

EE 602—Advanced System Theory 2. 3 credits
Prerequisite: EE 601. Further applications of matrix methods to the study of dynamic systems and electric networks; extension to discrete, non-linear and non-stationary systems. Markov processes.

EE 611—Physical Optics for Engineers 1. 3 credits
Prerequisites: MS 502, MS 503. Electromagnetic theory of light waves; Fresnel laws of reflection and refraction; light polarization and interference phenomena.

EE 612—Physical Optics for Engineers 2. 3 credits
Prerequisite: EE 611. Diffraction; theory of partial coherence of light; optics of metals; crystal optics.

EE 613—Laser Technology. 3 credits
Prerequisites: EE 611, PS 540. Theory of stimulated emission processes and the design of laser systems.

EE 614—Electro-Optics. 3 credits
Prerequisite: PS 540 or consent of instructor. Crystal optics; interaction of light with matter; electro-optic and magneto-optic effects; non-linear optics; light modulation and detection; applications.

EE 621—Electronics: Devices. 3 credits
Prerequisite: Undergraduate atomic physics course or modern materials course. Properties of semiconductors, carrier motion, junction behavior, diodes, transistors, field-effect devices, Esaki diodes and other devices.

EE 622—Electronics: Video Amplifiers. 3 credits
Prerequisite: Typical modern required undergraduate electronics sequence. Linear models of transistors, design of video amplifiers, peaking methods, time-domain and frequency-domain methods, distributed amplification, feedback designs.

EE 623—Electronics: Band-Pass Amplifiers. 3 credits
Prerequisite: EE 622. Filter characteristics: maximally-flat, Chebyshev, flat-delay; stagger-tuning, stagger-damping, active RC circuits, minimal-noise amplifiers.

EE 630—Advanced Circuit Analysis. 3 credits
Network fundamentals; network characterization; frequency analysis; superposition integrals; signal-flow techniques; stability problems; real and imaginary relations.

EE 631—Generalized Network Theory. 3 credits
Prerequisite: EE 630 or EE 634. Theory of networks which are not necessarily linear, lumped, passive and reciprocal. The gyrator. Extensions of classical methods to the study of these more general networks.

EE 632—Non Linear Circuits. 3 credits
Prerequisite: EE 630 or EE 634. Analytical and topological approaches to non-linear circuits; approximate solutions; non-linear resonance; relaxation oscillations.

EE 634—Introduction to Network Synthesis. 3 credits
Network functions; impedance and frequency scaling; physical realizability; 2-terminal network synthesis methods.

EE 635—Modern Filter Synthesis. 3 credits
Prerequisite: EE 634. Insertion-loss synthesis of 4-terminal networks; frequency transformation; approximation problems; the potential analogy.

EE 636—Transfer Function Synthesis. 3 credits
Prerequisite: EE 634. Properties and realizability of 4-terminal networks. Synthesis of transfer functions with ladders, lattices and parallel-ladder networks. The prediction method.

EE 640—Noise in Linear Systems. 3 credits
Passage of electrical noise and signals through linear filters and systems. Statistical representation of random signals and electrical noise (time and ensemble averages of continuous random variables), autocorrelation, cross-correlation and power spectral densities.

EE 641—Theory of Communication 1. 3 credits
Prerequisites: EE 640, EE 600 or EE 630. The narrow-band Gaussian random process as a representation of electrical noise; optimum linear communication systems, smoothing and prediction.

EE 642—Theory of Communication 2. 3 credits
Prerequisite: EE 641. Filtering, modulation and demodulation of signals corrupted by noise; passage of electrical noise and signals through nonlinear filters and systems.

EE 645—Statistical Decision Theory. 3 credits
Prerequisite: EE 641. Hypothesis testing of signals in the presence of noise by Bayes, Neyman-Pearson, minimax criteria; statistical estimation of signal parameters; optimum filters and receivers; ambiguity functions and inverse probability.

EE 646—Space Communications. 3 credits
Prerequisite: EE 641. Telemetering systems, space communication links, satellite communications systems, space tracking and navigation systems.

EE 647—Information Theory. 3 credits
Quantitative measure of information and its properties; information sources, noiseless channels and information compression; noisy channels and channel capacity; introduction to error-correcting codes.

EE 648—Error Correcting Codes. 3 credits
Algebraic coding theory, group codes, Hamming codes, Reed-Muller codes, Bose-Chaudhuri codes, Fire codes, recurrent codes, and other burst-error correcting codes. Encoder and decoder implementation by linear feedback shift registers.

EE 651—Electromagnetic Fields and Waves. 3 credits
Prerequisite: Undergraduate course in fields and waves. Electromagnetic theory applied to engineering including static field problems and propagation, reflection and guiding of electromagnetic waves.

EE 652—Antennas and Wave Propagation. 3 credits
Prerequisite: EE 651. Antenna systems and wave propagation in anisotropic media.

EE 653—Wave Propagation in Plasmas. 3 credits
Prerequisite: Undergraduate course in fields and waves. Electrical properties of plasma. Plasma oscillations. Propagation of electromagnetic, space-charge and acoustic waves. Microwave diagnostics.

EE 655—Active Microwave Devices. 3 credits
Prerequisite: EE 651. Formation and focusing of electron beams; space-charge waves; principles and theory of klystron amplifiers and oscillators, traveling-wave tubes, backward wave oscillators, crossed-field amplifiers and oscillators.

EE 656—Waveguides and Microwave Networks. 3 credits
Prerequisite: EE 651. Theory of rectangular and cylindrical waveguides; resonant cavities. Microwave network theory; one-ports, two-ports, n-ports; scattering matrix. Directional couplers, magic tees, circulators.

EE 657—Coupled-Mode Theory. 3 credits
Prerequisite: Senior-level course in fields and waves. Theory of the coupled-mode formalism. Application to coupled linear oscillators, directional couplers, traveling-wave amplifiers, backward wave oscillators, distributed and lumped circuit parametric amplifiers.

EE 661—Analysis and Synthesis of Combinatorial Switching Circuits. 3 credits
Prerequisite: EE 561. Boolean algebra; switching circuits; minimization techniques; multi-output and multi-level combinatorial circuits; threshold logic. Applications to computer and switching system design.

EE 662—Sequential Switching Circuit Design. 3 credits
Prerequisite: EE 661. The basic circuit model; timetable and problem statement; state diagram and flow table; equivalent states and merged flow table; secondary state assignment; output map and hazards elimination. Pulse, asynchronous, and linear sequential circuits.

EE 663—Introduction to Automata Theory—Finite-State Machines. 3 credits
Moore & Mealy model of finite-state machines, transition table, diagrams and matrices, equivalence and machine minimization, state identification and machine identification experiments, finite-memory machines, introduction to Turing machines.

EE 665—Electronic Analog and Hybrid Computers 1. 3 credits
System design considerations for analog and hybrid computers. Simulation techniques.

EE 666—Electronic Analog and Hybrid Computers 2. 3 credits
Prerequisite: EE 665. Combined analog and digital computing systems. Performance comparison, mathematical models of hybrid systems. Error analysis and scaling in hybrid computers.

EE 667—Electronic Analog and Hybrid Computers 3. 3 credits
Prerequisites: EE 666, EE 640. Statistical measurement techniques, digital differential analyzers. Hybrid optimization techniques.

EE 668—Digital Systems Control. 3 credits
Prerequisite: EE 670. Sampling theorems, numerical analysis, number series, error analysis of digital systems, digital simulation, the digital computer as a control component.

EE 670—Control System Theory and Practice 1. 3 credits
Introduction to the general control problem and its division into the three subproblems: selection of control criterion, model building and selection of control strategy. State variable and classical analysis of multidimensional time-invariant systems.

EE 671—Control System Theory and Practice 2. 3 credits
Prerequisite: EE 670. The servo and regulator problem—classical and modern synthesis methods. Nonlinear analysis methods with emphasis on intentional design techniques. Signal-modulated systems.

EE 672—Control System Theory and Practice 3. 3 credits
Prerequisite: EE 670. The computer as a design tool. On-line computer control with comparison of analog, digital and hybrid design methods. Optimal control system design methods with emphasis on the static or quasi-static case.

EE 673—Optimum Systems Control. 3 credits
Prerequisite: EE 670 or EE 601. Variational calculus. Optimization theory for continuous and discrete systems with deterministic inputs. The Maximum Principle, Hamilton-Jacobi theory. Dynamic programming.

EE 674—Adaptive and Optimum Systems Control. 3 credits
Prerequisites: EE 673, EE 640. Stochastic system problems, Kalman-Wiener filtering for continuous and discrete linear systems. State and parameter estimation in nonlinear systems. Optimum adaptive control.

EE 675—Computational Techniques in Systems Control. 3 credits
Prerequisite: EE 673. Quasilinearization, differential approximation, invariant imbedding, gradient techniques. Sequential estimation and control. Suboptimal control.

EE 676—Inertial Guidance and Control. 3 credits
Prerequisite: EE 670. Modern navigational and vehicle guidance and control techniques based upon usage of inertial reference.

EE 679—Nonlinear Control Systems. 3 credits
Prerequisite: EE 673. Stability of discrete and continuous systems using the second method of Liapunov. Use of the second method as a design tool. Popov stability. Wiener theory of nonlinear systems.

EE 680—Electric Power Systems 1. 3 credits
Operation of power systems under static symmetrical conditions. Standard network models. Voltage, frequency and power control. Economic and geographical constraints. Pooling. Optimum power scheduling.

EE 681—Electric Power Systems 2. 3 credits
Prerequisite: EE 680. Operation of power systems under dynamic conditions. Dynamic models. Protective strategies and emergency routing schemes. High voltage DC.

EE 682—Electric Power Systems 3. 3 credits
Prerequisite: EE 681. The computational aspects of system operation. A comparison of analog computers (including the network analyzer) versus the digital computer as a design tool and as an "on-line" device.

EE 685—Advanced Electrical Machinery. 3 credits
A general formulation of electromechanical energy conversion. Applications of Lagrange's equation and Hamilton's principle to the evaluation of the characteristics and operation of physical devices.

EE 687—Advanced Electrical Measurements. 4 credits
Electrical standards including National Bureau of Standards traceability. Lectures and laboratory experience in modern practice of electrical measurements and data acquisition methods in complex systems.

EE 691—Special Topics in Electrical Engineering 1 to 6 credits
Laboratory, lectures, and/or conferences covering specially selected topics in electrical engineering. May be repeated with change of content up to a maximum of 18 credits including EE 692.

EE 692—Special Topics in Electrical Engineering. 1 to 6 credits
Continuation of EE 691. May be repeated with change of content up to a maximum of 18 credits including EE 691.

EE 695—Graduate Seminar. 1 credit
Discussion of topics in fields of graduate study and research. May be repeated with change of content up to a maximum of 4 credits.

EE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

EE 799—Doctoral Research. 1 to 12 credits

# ENGINEERING SCIENCE AND MECHANICS

## GRADUATE FACULTY 1966-67

Nash, W. A., *Chairman*; Armenakas, A. E.; Arthur, P. D.; Chen, Y. M.; Ebcioglu, I. K.; Edson, C. G.; Eisenberg, M. A.; Hartley, C. S.; Hill, C. C.; Lindgren, E. R.; Lu, S. Y.; Nevill, G. E., Jr.; Sawyer, W. L.; Sciammarella, C. A.; Siekmann, J.

The requirement for admission to the graduate program is a bachelor's degree in engineering sciences or in a related field of engineering or the physical sciences. Students from all fields will be expected to demonstrate a comprehensive knowledge of the material covered in undergraduate engineering mechanics courses.

*Special requirements of degree programs:* A minor in mathematics is required for both Master of Science in Engineering and Doctor of Philosophy programs. A reading knowledge of German and Russian is required for the Doctor of Philosophy. ESM 601—Introduction to Continuum Mechanics is required for all students at the time they begin graduate study.

Students taking 500-level courses for graduate major credit will be required to do additional reading, problems and reports.

The following *Engineering Core Courses* are available for graduate major credit: EGC 541—Tensor Fields and Fluid Dynamics; EGC 601—Theory of Fluid Flow 1; EGC 602—Theory of Fluid Flow 2; EGC 603—Theory of Fluid Flow 3; EGC 604—Boundary Layer Theory; EGC 605—Theories of Turbulent Flows; EGC 611—High Speed Gas Dynamics 1; EGC 612—High Speed Gas Dynamics 2; EGC 613—High Speed Gas Dynamics 3.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ESM 530—Individual Study 1. 1 to 9 credits. Maximum 9 credits
ESM 536—Intermediate Dynamics. 3 credits
ESM 546—Fundamental Vibration Analysis. 3 credits

## GRADUATE COURSES

ESM 601—Introduction to Continuum Mechanics 1. 3 credits
Prerequisites: ESM 303, MS 502. Tensor properties of stress and strain. General discussion of Cartesian tensors. Equations of motion and compatibility.

ESM 602—Introduction to Continuum Mechanics 2. 3 credits
Prerequisite: ESM 601. Relations between stress, strain, and strain rate for elastic, plastic and viscous solids; also for compressible and viscous fluids. Thermodynamics of continua.

ESM 603—Advanced Continuum Mechanics. 3 credits
Prerequisite: ESM 602. A comprehensive, unified treatment of the mathematical theories of solid and fluid mechanics, including gases.

ESM 610—Analytical Techniques for Engineers and Scientists 1. 3 credits
Prerequisites: MS 501, MS 502, MS 504, preferably some knowledge of linear algebra. Hilbert space, linear operators in Hilbert space, spectral analysis of self-adjoint and formally self-adjoint operators, generalized functions and applications.

ESM 611—Analytical Techniques for Engineers and Scientists 2. 3 credits
Prerequisite: ESM 610. Application of spectral theory of linear operators to differential equations, eigenfunction expansion, Green's function techniques, method of separation of variables and integral transform techniques.

ESM 612—Analytical Techniques for Engineers and Scientists 3. 3 credits
Prerequisites: ESM 610, ESM 611. Application of spectral theory of linear operators to integral equations, asymptotic solutions and evaluation of integrals, perturbation methods, WKB method, variational methods, and Wiener-Hopf technique.

ESM 613—Principles of Engineering Analysis 1. 3 credits
Prerequisites: ESM 610, ESM 611. Principles and techniques of ordinary differential equations, classification of singularities, Frobenius method, spectral analysis of self-adjoint and formally self-adjoint operators and stability.

ESM 614—Principles of Engineering Analysis 2. 3 credits
Prerequisites: ESM 610, ESM 611. Principles and techniques of partial differential equations, initial and boundary value problems of hyperbolic and differential equations, and applications to problems in engineering and sciences.

ESM 615—Principles of Engineering Analysis 3. 3 credits
Prerequisite: ESM 614. Principles and techniques of partial differential equations

of elliptic and parabolic types, maximum principle, mean value theorem, potential theory and other applications.

ESM 616—Principles of Engineering Analysis 4. 2 credits

Prerequisites: ESM 610, ESM 612. Principles and techniques of linear nonsingular integral equations, solution of Fredholm integral equations, and solution of Volterra equations.

ESM 617—Principles of Engineering Analysis 5. 3 credits

Prerequisite: ESM 616. Principles and techniques of singular and nonlinear integral equations, solutions of Abel, Cauchy and Wiener-Hopf equations, and solution of Hammerstein's and Milne's nonlinear integral equations.

ESM 618—Approximation Techniques in Engineering and Sciences 1. 3 credits

Prerequisite: ESM 612. Asymptotic solutions of differential and integral equations, geometrical theory of diffraction, regular and singular perturbations, WKB method and variational methods.

ESM 619—Approximation Techniques in Engineering and Sciences 2. 2 credits

Prerequisite: ESM 612. Krylov-Bogoliubov-Whitham's averaging technique for nonlinear differential equations. Chapman-Enskog's and Grad's approximate solution of Boltzmann equation, and other approximation techniques.

ESM 631—Nonlinear Mechanics 1. 2 credits

Prerequisites: ESM 302, ESM 546, MS 501. Phase plane and singular point methods, limit cycle of Poincare, stability including the second method of Liapunov. Topological approaches. Perturbations; asymptotic methods for autonomous and nonautonomous systems.

ESM 632—Nonlinear Mechanics 2. 2 credits

Prerequisite: ESM 631. Stroboscopic methods, oscillations of nearly linear systems. Parametric excitation and the interaction of nonlinear oscillations. Relaxation oscillations.

ESM 633—Elastic Behavior of Materials 1. 3 credits

Prerequisite: ESM 303. Analysis of stress and strain in deformable bodies. Unsymmetric bending of beams, deformation of curved beams. Beams on elastic foundations. Bending of deep beams.

ESM 634—Elastic Behavior of Materials 2. 3 credits

Prerequisites: ESM 303, MS 501. Introductory theory of plates, elementary theory of shells. Bending of shells of revolution. Generalized energy methods. Introduction to variational techniques.

ESM 635—Elastic Behavior of Materials 3. 3 credits

Prerequisites: ESM 303, MS 501. Stress-strain relations, compatibility laws, and governing equations for stresses and deformations in two-dimensional elastic bodies. Stress concentrations, contact stresses.

ESM 644—Advanced Dynamics 1. 3 credits

Prerequisite: ESM 536. Dynamics of particles and rigid bodies applied to advanced engineering problems utilizing variational and transformation principles.

ESM 645—Advanced Dynamics 2. 3 credits

Prerequisite: ESM 644. Theory and application of Lagrangian equations to engineering problems. Hamilton-Jacobi theory and its applications.

ESM 647—Intermediate Vibrations. 3 credits

Prerequisite: ESM 546. Instrumentation for vibration analysis. Longitudinal and torsional vibrations of bars, lateral vibration of bars, membranes and plates. Torsional vibrations of continuous systems.

ESM 648—Advanced Vibrations. 3 credits
Prerequisite: ESM 647. Generalized coordinates and Lagrange's equations. Application of the Rayleigh-Ritz and various approximate methods. Theory and instrumentation for random vibrations.

ESM 649—Experimental Stress Analysis 1. 3 credits
Prerequisites: ESM 635, ESM 670. Theory and application of various experimental techniques to problems of elasticity and plasticity.

ESM 650—Experimental Stress Analysis 2. 3 credits
Prerequisite: ESM 649. General optical theory of propagation of light in anisotropic media. Three-dimensional photoelasticity; theory and applications.

ESM 651—Experimental Stress Analysis 3. 3 credits
Prerequisite: ESM 650. Moire method, two- and three-dimensional applications. Mathematical theory of similitude and model analysis.

ESM 652—Theory of Elasticity 1. 3 credits
Prerequisites: ESM 601, ESM 635. Linear theory of homogeneous, isotropic, elastic media. Analysis of stress and strain. Nonlinear considerations.

ESM 653—Theory of Elasticity 2. 3 credits
Prerequisite: ESM 652. Tensor development of stress-strain laws and basic equations of elasticity. Two-dimensional problems. Energy and variational methods.

ESM 654—Theory of Elasticity 3. 3 credits
Prerequisite: ESM 653. Two-dimensional problems and their solutions by complex variable methods. Three-dimensional problems including torsion, bending, stress concentration, thermal stress and stress-wave propagation.

ESM 660—Properties of Materials. 3 credits
Prerequisite: ESM 633. Mechanical and thermodynamic analysis of the properties of materials. Creep, fatigue, stress relaxation characteristics; thermal cycling response; mechanical properties at elevated temperatures.

ESM 667—Theory of Elastic Stability 1. 3 credits
Prerequisite: ESM 634. Lateral buckling of beams; shear buckling, instability of bars due to bending, twisting or shear. Buckling of circular rings. Buckling of circular, rectangular and triangular plates. Plastic buckling.

ESM 668—Theory of Elastic Stability 2. 2 credits
Prerequisite: ESM 667. Buckling of spherical, cylindrical and conical shells. Plastic buckling of shells. Buckling of nonconservative systems.

ESM 670—Introduction to Inelastic Behavior of Materials. 3 credits
Prerequisites: ESM 303, MS 501. Fundamental inelastic theory including plasticity and viscoelasticity. Applications to beams, bars, rings and plates. Dynamic inelastic effects. Problems in creep and stress relaxation.

ESM 671—Theory of the Inelastic Continuum 1. 3 credits
Prerequisites: ESM 601, ESM 670. A study of stress and strain in inelastic media. Flow, deformation and incremental theories. Ideally plastic media.

ESM 672—Theory of the Inelastic Continuum 2. 3 credits
Prerequisite: ESM 671. Flow in strain hardening materials. Wave propagation in inelastic materials. Theory of metal forming processes.

ESM 673—Theory of Plates and Shells 1. 3 credits
Prerequisites: ESM 303, ESM 634, MS 501. Fundamental equations for the bending and stretching of thin plates with small deformations. Large deformations of plates with nonlinear considerations.

ESM 674—Theory of Plates and Shells 2. 3 credits
Prerequisite: ESM 673. Energy methods applied to plate problems. Thermal stresses in plates. General theory of deformation of thin shells.

ESM 675—Theory of Plates and Shells 3. 3 credits
Prerequisite: ESM 674. Large deformation theories for thin shells. Application of various approximate shell theories to engineering problems.

ESM 676—Numerical Methods of Engineering Analysis 1. 2 credits
Prerequisite: ESM 635. Relaxation methods, method of minimum potential energy. Variational principles, Rayleigh-Ritz method, Galerkin's method.

ESM 677—Numerical Methods of Engineering Analysis 2. 2 credits
Prerequisite: ESM 676. Treffitz's procedure, Prager's function space concept; perturbation and collocation procedures.

ESM 692—Special Topics in Engineering Mechanics. 1 to 9 credits
May be repeated with change of content up to a maximum of 18 credits.

ESM 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ESM 799—Doctoral Research. 1 to 12 credits

# INDUSTRIAL AND SYSTEMS ENGINEERING

## GRADUATE FACULTY 1966-67

Braswell, R. N., *Chairman*; Burns, J. F.; Gue, R. L.; Hicks, P. E.; Leavenworth, R. S.; Mahoney, J. F.; Martinson, E. P. (*emeritus*); Moreau, D. H.; Nattress, J. A.; Patterson, R. L.; Proctor, C. L.; Schaake, J. C.; Sivazlian, B. D.; Stanfel, L. E.; Thomas, M. E.; Turvaville, L. J.; Valisalo, P. E.; Vickers, F. D.; Wilcox, D. B.

In addition to the requirements of the Graduate School, a prerequisite for admission to graduate work in Industrial and Systems Engineering is a degree in one of the engineering disciplines, mathematics, statistics or physics. Where the student's background is deficient, an articulation program of foundation courses will be required.

The Ph.D. in operations research and systems engineering is offered by the Industrial and Systems Engineering Department. Applicants for the program will take a comprehensive counseling examination covering basic material in mathematics, statistics, optimization theory, stochastic processes, systems analysis, and computer software systems. The student's doctoral program is determined by evaluating the results of the examination, his past academic experience and a personal interview with the applicant by the departmental graduate faculty.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ISE 530—Predetermined Time Standards. 3 credits
ISE 531—Principles of Job Evaluation. 3 credits
ISE 550—Computer Programming Systems. 3 credits
ISE 551—Digital Computer Techniques. 3 credits
ISE 557—Analog Simulation Techniques. 3 credits
ISE 558—Hybrid Computer Techniques. 3 credits
ISE 562—Reliability Engineering. 3 credits
ISE 570—Operations Analysis 1. 3 credits
ISE 571—Operations Analysis 2. 3 credits
ISE 580—Systems Analysis 1. 3 credits
ISE 581—Systems Analysis 2. 3 credits

## GRADUATE COURSES

ISE 601—Classical Optimization Theory. 3 credits

Prerequisites: Matrix theory, advanced calculus. Necessary and sufficient conditions for maxima and minima of differentiable functions; unconstrained, equality constrained, and inequality constrained functions.

ISE 602—Dynamic Programming. 3 credits

Prerequisite: ISE 601. Characterization of multistage decision problems as a sequence of single-stage problems. Functional equation of dynamic programming, composition and Mitten's sufficiency condition. Markovian decision problems, state variable reduction techniques and related approximation schemes.

ISE 603—Dynamic Optimization Theory. 3 credits

Prerequisites: ISE 601, ISE 602. Dynamic programming approach to the necessary conditions of variational calculus. Pontryagin's Maximum Principle, continuous and discrete. Comparison of variational approach and dynamic programming from a computational point of view.

ISE 604—Linear Programming. 3 credits

Prerequisite: Matrix theory. The theoretical and computational aspects of linear programming. Simplex method, degeneracy, revised simplex method, transportation problems, network flows, and sensitivity analysis.

ISE 605—Advanced Topics in Linear Programming. 3 credits

Prerequisite: ISE 604. Duality in linear programming. Multistage linear programming, integer programming, stochastic programming, and zero-one programming. Various solution algorithms will be derived and discussed.

ISE 606—Nonlinear Programming. 3 credits

Prerequisite: ISE 601, ISE 605. Development of optimization techniques for static and dynamic nonlinear systems subject to various constraints. Inequality theorems, geometric programming, convex programming, decomposition and optimum seeking methods.

ISE 610—Inventory Theory. 3 credits

Prerequisite: STA 660, ISE 603. Inventory models for analyzing systems containing raw material, in-process material, and finished products. Marginal analysis of costs. Probabilistic description and analysis of inventory systems.

ISE 611—Industrial Dynamics 1. 3 credits

Prerequisites: Computer programming and probability theory. Analysis of the dynamics of industrial systems, emphasizing models that incorporate decision making, its interactions with information, money, orders, material, personnel and capital equipment, using theories of elementary feedback systems, difference equations and probability.

ISE 612—Industrial Dynamics 2. 3 credits

Prerequisite: ISE 611. Continuation of ISE 611 to include dynamic simulation models, improvement of system behavior through changes in system structure and decision policy and the interpretation of simulation results relative to system objective.

ISE 620—Games and Gaming. 3 credits

Prerequisites: Matrix theory, probability theory. Games in extensive and normal form. Two-person games. Formulation of two-person games as a linear programming problem. Cooperative and noncooperative games. Concepts and methods of gaming, including experimental management gaming.

ISE 621—Decision Theory. 3 credits

Prerequisites: STA 540, ISE 620. Formulation of competitive strategies as a

decision model. Criteria for decisions. Statistical decision models. Utility functions. Application to engineering economics.

ISE 622—Engineering Valuation. 3 credits

Prerequisites: Matrix theory, engineering economy, introduction to probability theory. Mathematical models for analyzing classes of engineering alternatives from an economic viewpoint. Programming plant expansion. Project evaluation and budgeting. Quantification of intangible factors.

ISE 630—Advanced Topics in Industrial Engineering. 3 credits

An intensive study of new industrial engineering problems arising from changes in the socio-economic environment. Emphasis on problem formulation.

ISE 631—Work Measurement Theory. 3 credits

Prerequisite: A course in work design. Analysis and evaluation of background theory and applications of systems of work measurement and work methods. Comparisons between systems.

ISE 632—Facilities Systems Design. 3 credits

Prerequisite: A course in facilities planning or plant layout. Studies in the design of modern and evolutionary industrial systems. Manpower, power and materials requirements.

ISE 640—Human Factors Engineering. 3 credits

Prerequisite: A course in human engineering or perceptual psychology. Analysis of the effects of human factors on the performance of systems containing extensive man-machine interactions.

ISE 641—Behavior Systems Engineering. 3 credits

Prerequisite: ISE 640. Behavioral and engineering principles underlying prediction and management of human behavior, design of organization systems, and development of synthetic behavior systems.

ISE 642—Man-Machine Systems Design. 3 credits

Prerequisite: ISE 640. Engineering design concepts of interfaces between man and machines.

ISE 650—Theory of Programing. 3 credits

Prerequisite: ISE 550. The theoretical aspects and historic development of modern digital computers, programming techniques and software systems.

ISE 651—Digital Simulation Techniques. 3 credits

Prerquisite: ISE 550. Computer programming aspects of digital simulation. Use of simulation languages such as SIMSCRIPT or GPSS. Simulation of large-scale, mathematically indeterminate systems.

ISE 652—Dynamic Modeling and Simulation. 3 credits

Prerequisites: ISE 550, STA 660. Dynamic modeling and simulation methods for input-output analysis of complex systems. Computational techniques.

ISE 653—Information Systems Analysis and Design. 3 credits

Prerequisite: ISE 550. Analysis and design of large-scale information decision systems. Operations research and systems analysis applications in information systems evaluation. Real time vs. non-real time systems. Development, installation, and control of information processing systems.

ISE 654—Time Sharing Systems Design. 3 credits

Prerequisite: ISE 650. Special design considerations in hardware and software for time sharing. Multi-processing, multi-programming, static and dynamic reallocation and remote terminal operation.

ISE 655—Software Systems Design. 3 credits

Prerequisite: ISE 650. The design and use of computer programming systems

involving machine translated languages. Theory of compilers based on syntatic decomposition and recursive processing.

ISE 657—Analog Computer Techniques. 3 credits

Prerequisite: ISE 557. Analog computer techniques to study complex systems. Analog computer logic as an additional tool in problem solving. Boundary value problems and dynamic parameter optimization techniques.

ISE 658—Analog-Hybrid Systems. 3 credits

Prerequisite: ISE 657. Hybrid computer systems, both hardware and software. Sampling theory, quantizing theory and error analysis. Hybrid computer techniques for solving partial differential equations and optimization problems. Examples of adaptive control systems.

ISE 659—Advanced Hybrid Computer Techniques. 3 credits

Prerequisite: ISE 557. Hybrid computer techniques that are superior to digital or analog techniques. Boundary value, dynamic parameter optimization, fluid network simulation, optimal control and techniques such as random search, steepest ascent, gradient methods, dynamic programming and the maximum principle.

ISE 660—Statistical Quality Control. 3 credits

Prerequisites: Matrix theory, quality control, STA 540. Sampling theory, using chi-square, beta, and F-distributions. Distribution free tolerance intervals on population fractions defective. Control chart theory; Bayesian decision rules. Truncated sampling plans. Variance reducing sampling procedures. Systems analysis approach to quality control.

ISE 661—Statistical Forecasting Models. 3 credits

Prerequisites: Matrix theory, STA 660. Extracting information in a time series. Classification of models for forecasting. Identification, estimation of parameters, and validation of models.

ISE 662—Reliability Theory. 3 credits

Prerequisites: Matrix theory, STA 540, ISE 562. Reliability models as a function of system configurations. Reliability prediction for various underlying component failure laws. Sensitivity analysis. Models of interdependent systems.

ISE 670—Mathematical Methods of Operations Research 1. 3 credits

Prerequisites: Matrix theory, transform theory, probability theory. Topics covered include theory of queues, classical optimization and linear programming.

ISE 671—Mathematical Methods of Operations Research 2. 3 credits

Prerequisite: ISE 670. Continuation of ISE 670. Includes dynamic programming, non-linear programming, the maximum principles, game theory and decision theory.

ISE 680—Queuing Theory. 3 credits

Prerequisites: Matrix theory, transform theory, STA 660. Classification of queuing systems and waiting line problems. Model formulation. Analysis of selected systems. Applications to engineering systems.

ISE 681—Stochastic Service Systems. 3 credits

Prerequisite: ISE 670. Modeling of large-scale engineering systems. Input-output analysis. Methods of handling uncertainty. Optimum design.

ISE 682—Systems Analysis and Design 1. 3 credits

Prerequisite: ISE 581. Analysis and design of special-purpose operational, procedural, and hardware systems with emphasis on feedback, control, and trade-off models. Extension and use of optimization theory.

ISE 683—Systems Analysis and Design 2. 3 credits

Prerequisite: ISE 682. Continuation of ISE 682 to include a systems design

project emphasizing the use of modern tools in operations research and systems engineering.

ISE 690—Graduate Seminar. 0 to 1 credit

Discussions in the field of graduate study and research. May be repeated for additional credit.

ISE 691—Methods of Experimental Research. 3 credits

Experimental methods reviewed and analyzed with reference to the solution of selected industrial and systems engineering research problems.

ISE 698—Special Problems. 1 to 9 credits

Laboratory, lecture, field work or conferences covering selected industrial problems. May be repeated with change of content up to a maximum of 18 credits.

ISE 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ISE 798—Special Problems. 1 to 9 credits

Laboratory, lecture, field work or conferences covering special selected industrial and systems problems. May be repeated with change of content up to a maximum of 18 credits.

ISE 799—Doctoral Research. 1 to 12 credits

# MECHANICAL ENGINEERING

## GRADUATE FACULTY 1966-67

Gaither, R. B., *Chairman*; Bourke, N. (*emeritus*); Farber, E. A.; Flanigan, F. M.; Gilbert, J. S.; Huckert, J. W.; Irey, R. K.; Peninngton, C. W.; Prescott, F. L. (*emeritus*); Reed, J. C.; Roan, V. P., Jr.; Schwartz, F. L.; Smith, W. O.; Tesar, D.

Programs leading to advanced degrees are available in the areas of thermodynamics, heat transfer, fluid dynamics, solar energy, energy conversion, machine design analysis, environmental control and refrigeration.

The following *Engineering Core Course* is available for graduate major credit: EGC 541—Tensor Fields and Fluid Dynamics.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

ME 520—Control System Theory. 3 credits

ME 560—Statistical Thermodynamics. 3 credits

ME 591—Gas Turbines and Jet Engines. 3 credits

ME 593—Mechanical Design 1. 3 credits

ME 594—Mechanical Design 2. 3 credits

## GRADUATE COURSES

ME 620—Instrumentation and Measurements Laboratory. 1 credit

Methods of measuring properties most often encountered in modern research; actual measurement, rather than theory, is emphasized.

ME 621—Feedback Control System Design 1. 3 credits

Prerequisite: Consent of instructor. Design and compensation of linear feedback control systems. Mechanical, hydraulic, pneumatic, electromechanical systems.

ME 623—Feedback Control System Design 2. 3 credits

Prerequisite: Consent of instructor. Design and compensation of linear and nonlinear feedback control systems. Process control satellite attitude control aerospace vehicle control.

ME 624—Feedback Control System Design 3. 3 credits
Prerequisite: Consent of instructor. Design of linear and nonlinear feedback control systems by state space techniques. Optimal control, adaptive control.

ME 650—Special Topics in Fluid Dynamics. 3 credits
Prerequisite: ME 652. Unconventional flows of current interest, free molecule flow, ionized gas flows and magnetohydrodynamics, jet mixing theory; diagnostics and experimental techniques.

ME 651—Special Topics in Heat Transfer. 3 credits
Prerequisites: ME 655, ME 656, ME 657, or consent of instructor. Advanced heat transfer analysis considering the three modes, conduction, convection, and radiation.

ME 652—Thermodynamics of Fluid Flow 1. 3 credits
Laws of mechanics, thermodynamics, and heat transfer combined to give general relationships for the solution and better understanding of flow phenomena.

ME 653—Thermodynamics of Fluid Flow 2. 3 credits
Prerequisite: ME 652. Continuation ME 652.

ME 654—Thermodynamics of Fluid Flow 3. 3 credits
Prerequisite: ME 653. Continuation of ME 653.

ME 655—Conduction Heat Transfer. 3 credits
Prerequisites: MS 420, ME 430. Mathematical description of conduction. Solution of conduction problems by series, transform and numerical methods in generalized unsteady systems with appropriate boundary conditions.

ME 656—Convective Heat Transfer 1. 3 credits
Prerequisites: MS 420, ME 430. The equations of motion for continuum fluids. Solutions and consideration of the above, the Prandtl Boundary Layer, and the integral forms of the equations. Turbulent equations of motion and the analogy between heat and momentum transfer. Phase change heat transfer.

ME 657—Radiation Heat Transfer. 3 credits
Prerequisites: MS 420, ME 430. Physics of radiation, general integral equations, simplified analyses for diffuse and gray surfaces. Equation of transfer and simplified participating gas analysis. Free molecule flow heat transfer.

ME 658—Convective Heat Transfer 2. 3 credits
Prerequisite: ME 656. Time average turbulent equations of motion. The concepts of the eddy viscosity and diffusivity tensor. Analogies between heat and momentum transfer in turbulent and laminar flow. Phase change heat transfer.

ME 659—Advanced Heat Transfer. 3 credits
Prerequisite: ME 430. Theoretical evaluation of physical constants. Techniques needed for the solution of heat transfer problems involving all three modes, conduction, convection, and radiation.

ME 660—Appplications of Kinetic and Statistical Theories. 3 credits
Kinetic theory of ideal and real gases, molecular behavior and the connection to macroscopic thermodynamics.

ME 661—Advanced Engineering Thermodynamics 1. 3 credits
The general equations of thermodynamics and their applications; advanced study of chemical and combustion processes.

ME 662—Applied Thermodynamics of Irreversible Processes. 3 credits
Prerequisite: ME 661. The Onsager reciprocal relations and their application in heat and electrical conduction and relaxation phenomena in continuous and discontinuous systems, including thermoelectricity.

ME 663—Energy Conversion. 3 credits
Prerequisites: ME 661, MS 420. The conversion of available forms of energy

into mechanical and electrical forms; energy conversion schemes, including conventional cycles in unusual environments, MHD, solar cells, thermionic and photogalvanic conversion and fuel cells.

ME 664—Combustion 1. 3 credits

Prerequisite: ME 661. Thermodynamics and kinetics of combustion, mass and heat transfer in combustion reactions. Normal and cool flames, detonation explosions. Ignition of combustion processes.

ME 665—Combustion 2. 3 credits

Prerequisite: ME 664. Combustion of gases, liquid and solid fuels in furnaces, internal combustion engines, rockets. Additives. Special topics in combustion.

ME 666—Solar Energy Utilization. 3 credits

Solar energy; its availability and characteristics; its conversion and utilization as heat, for power, refrigeration, distillation, photochemical reactions; solar energy as a research tool.

ME 667—Special Topics in Solar Energy 3 credits

Prerequisite: Undergraduate course in thermodynamics and heat transfer. Selective surfaces, solar traps, solar energy storage, solar fuel cells, direct conversion of solar radiation. May be repeated with a change of content up to a maximum of 9 credits.

ME 668—Gas Turbine Design and Performance. 3 credits

Prerequisite: ME 591. Design of gas turbine components and advanced performance calculations, based on best available gas properties and coordinated with actual data on large gas turbines, jets, etc.

ME 675—Advanced Air Conditioning 1. 3 credits

Criteria for air conditioning system selection and system design; air handling techniques including noise control, cleaning, temperature and humidity control; modern technological development and economical analysis.

ME 676—Advanced Air Conditioning 2. 3 credits

Prerequisite: ME 675. Industrial applications, special requirements for hospitals, schools, etc., survival shelter criteria.

ME 677—Advanced Refrigeration. 3 credits

Refrigeration methods and their application to specific needs; design of refrigeration devices and systems; new concepts.

ME 680—Advanced Dynamics of Machinery. 3 credits

Prerequisite: ME 492. Applications of theory and/or iterative approximations in the analysis, synthesis, and design of high-speed machine units in which dynamic loads predominate.

ME 681—Mechanical Vibrations 1. 3 credits

Linear and torsional vibrations; systems of one or more degrees of freedom; vibrations absorbers and dampers.

ME 682—Mechanical Vibrations 2. 3 credits

Prerequisite: ME 681 or consent of instructor. Vibration analysis of multicylinder engines, rotating machinery, and flexible members in linkages.

ME 683—Dynamic Synthesis of Direct Contact Mechanisms. 3 credits

Prerequisite: ME 491. The design of direct contact mechanisms by classical techniques of rigid body systems and finite differences applied to systems composed of elastic components.

ME 684—Infinitesimal Displacements in Coplanar Kinematics. 3 credits

Prerequisite: ME 492. Single position design kinematics based on analytical

formulations of curvature for 3, 4, and 5 infinitesimally separated positions; Euler-Savery equation, cubic of stationary curvature, and Burmester theory.

ME 685—Finite Displacements in Coplanar Kinematics. 3 credits
Prerequisite: ME 491. Finite displacements in coplanar motion synthesis. Selected problems in the design of linkage systems for 3, 4, and 5 positions.

ME 686—Spatial Kinematic Synthesis and Analysis. 3 credits
Geometry of motion in three dimensions. Single position design depending on orders of contact with spatial curves. Finitely separated position design by matrix methods. Synthesis and analysis of spatial motions.

ME 690—Mechanical Research 1. 1 to 3 credits
Research projects in mechanical engineering. May be repeated with change of content up to a maximum of 6 credits.

ME 691—Mechanical Research 2. 1 to 3 credits
Prerequisite: ME 690. Continuation of ME 690. May be repeated with change of content up to a maximum of 6 credits.

ME 692—Advanced Mechanical Laboratory 1. 3 credits
Experimental projects in mechanical engineering.

ME 693—Advanced Mechanical Laboratory 2. 3 credits
Continuation of ME 692.

ME 699—Master's Research. 0 to 9 credits. Maximum 24 credits

ME 799—Doctoral Research. 1 to 12 credits

# METALLURGICAL AND MATERIALS ENGINEERING

## GRADUATE FACULTY 1966-67

Rhines, F. N. *Chairman*; DeHoff, R. T.; Gould, R. W.; Guy, A. G.; Hartley, C. S.; Hench, L. L.; Hren, J. J.; Hummel, R. E.; Kronsbein, J.; Reed-Hill, R. E.; Tiffin, W. T.; Verink, E. D., Jr.; Welch, A. P.

The minimum basic requirement for admission to the graduate program in metallurgical engineering is a bachelor's degree in metallurgical engineering, or a related field of engineering, or science. Those graduate students who can present the prerequisites for the graduate courses in metallurgy, without having to schedule more than 18 credits in advanced undergraduate metallurgy, will be considered to have fulfilled this requirement. Each candidate for the doctorate, registering as a graduate student for the first time at the University of Florida, may be required to take a comprehensive examination in the field of metallurgical engineering. The purpose of this examination is to facilitate the planning of the candidate's graduate program.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MTL 510—Electronic Structure of Matter. 3 credits

MTL 511—Electronic Structure and Properties of Crystals 1. 3 credits

MTL 512—Electronic Structure and Properties of Crystals 2. 3 credits

MTL 520—Structure and Properties of Alloys. 3 credits

MTL 521—Solid-State Processes. 3 credits

MTL 522—Selection of Materials. 3 credits
MTL 540—Mechanical Metallurgy 1. 3 credits
MTL 541—Mechanical Metallurgy 2. 3 credits
MTL 542—Metal Forming. 3 credits
MTL 550—Chemical Metallurgy 1. 3 credits
MTL 551—Corrosion. 3 credits
MTL 552—Chemical Metallurgy 2. 3 credits
MTL 560—X-Ray Metallography. 2 credits
MTL 561—Elements of Electron Microscopy. 2 credits
MTL 595—Special Topics in Metallurgical and Materials Engineering. 3 credits. Maximum 6 credits
MTL 601—Advanced Phase Diagrams 1. 3 credits
Prerequisite: CY 453. An advanced course in the principles of phase diagrams considering systems with as many as four components, with emphasis on pressure-temperature-composition diagrams.
MTL 602—Advanced Phase Diagrams 2. 3 credits
Prerequisite: MTL 601. Continuation of MTL 601.
MTL 610—Theory and Properties of Metals and Alloys 1. 3 credits
Prerequisite: PS 644 or CY 641. Theory and structure of the free atom and assemblies of atoms; relationship of binding in solids to alloy formation, structures of metals and alloys, physical properties of metals and alloys.
MTL 611—Theory and Properties of Metals and Alloys 2. 3 credits
Prerequisite: MTL 610. Continuation of MTL 610.
MTL 612—Theory and Properties of Metals and Alloys 3. 3 credits
Prerequisite: MTL 611. Continuation of MTL 611.
MTL 620—Advanced Physical Metallurgy 1. 3 credits
Prerequisite: MTL 520 or consent of instructor. Kinetics of metallurgical processes; nucleation and growth, particle coarsening, martensite transformations, annealing and sintering processes.
MTL 621—Advanced Physical Metallurgy 2. 3 credits
Prerequisite: MTL 520 or consent of instructor. Continuation of MTL 620.
MTL 622—Advanced Physical Metallurgy 3. 3 credits
Prerequisite: MTL 520 or consent of instructor. Continuation of MTL 621.
MTL 625—Diffusion in Solids. 3 credits
Prerequisite: MTL 520. Physical basis, equations and theories of diffusion; tracer, chemical, multicomponent, and multiphase diffusion; diffusion in general force fields.
MTL 640—Advanced Mechanical Metallurgy 1. 3 credits
Prerequisite: MTL 540. Theory of elasticity; advanced theory of plasticity; theory and properties of dislocations; dislocation motion and interactions; application to deformation processes; survey of recent advances in the field.
MTL 641—Advanced Mechanical Metallurgy 2. 3 credits
Prerequisite: MTL 640. Continuation of MTL 640.
MTL 650—Metallurgical Thermodynamics. 3 credits
Prerequisite: MTL 550 or consent of instructor. Applications of generalized thermodynamics to metallurgical systems; surfaces in solids, irreversible processes.
MTL 651—Advanced Topics in Corrosion. 3 credits
Prerequisite: MTL 551 or consent of instructor. Theories and mechanisms of corrosion. Detailed discussion of current literature on oxidation and corrosion.

MTL 660—Advanced X-Ray Diffraction 1. 3 credits
Prerequisite: MTL 560. Advanced topics in x-ray diffraction as applied to materials.

MTL 661—Advanced X-Ray Diffraction 2. 3 credits
Prerequisite: MTL 660 or consent of instructor. Continuation of MTL 660.

MTL 662—Transmission Electron Microscopy. 3 credits
Prerequisite: MTL 561. Advanced topics in kinematical theory and dynamical theory of contrast from thin crystalline foils.

MTL 670—Seminar in Metallurgy. 1 credit
May be repeated with change of content.

MTL 675—Special Topics in Metallurgical Engineering. 1 to 6 credits
Laboratory, lectures or conferences covering specially selected topics in metallurgical engineering. May be repeated with change of content up to a maximum of 9 credits.

MTL 680—Atomic Processes in Crystalline Ceramics. 3 credits
Prerequisite: CY 451 or consent of instructor. Theory of ionic and covalent bonding, crystalline defect state, diffusion, ionic conductivity and phase transformations in ceramics. Reactions of solids, gases and liquids within ceramic systems.

MTL 681—Electronic Processes in Crystalline Ceramics. 3 credits
Introductory quantum and statistical mechanics and zone theory. Theory of semiconductor, dielectric, magnetic and optical properties in ceramic systems. Control of properties through microstructure and processing.

MTL 682—Structure and Properties of Glasses. 3 credits
Theory of glass structures, spinodal decomposition, nucleation and growth. Influence of compositions and thermal treatment on glass properties. Structure and properties of semiconductor, glass and insulator surfaces.

MTL 699—Master's Research. 0 to 9 credits. Maximum 24 credits

MTL 799—Doctoral Research. 1 to 12 credits

## NUCLEAR ENGINEERING SCIENCES

### GRADUATE FACULTY 1966-67

Uhrig, R. E., *Chairman*; Dalton, G. R.; Ellis, W. H.; Ohanian, M. J.; Parkinson, T. F. (*on leave*); Perez, R. B.; Rhines, F. N.; Sage, A. P.; Schneider, R. T.; Schoessow, G. J.; Wethington, J. A.; Wilhelm, H. E.

The requirement for admission to the graduate program for a master's degree in nuclear engineering sciences is a bachelor's degree in an approved program in engineering or in the physical sciences. Approved programs normally include one course in each of the following subjects: modern and nuclear physics (e.g., PS 340); heat transfer (e.g., ML 430, ML 431), fluid mechanics (e.g., ESM 311), introduction to nuclear engineering (e.g., NES 401, NES 402, NES 403) and two courses in mathematics beyond differential equations (e.g., MS 502, MS 503).

In certain cases when a student has demonstrated exceptional ability and expects to continue toward the degree of Doctor of Philosophy or when he has completed a master's thesis in another field or at another institution, he may petition the department to omit the thesis and substitute 18 credits of graduate-level course work, of which at least 9 credits are in nuclear en-

gineering. In such cases, the completion of 54 credits of course work will meet the requirements for the degree of Master of Engineering (non-thesis), with major in nuclear engineering sciences.

The following *Engineering Core Courses* are available for graduate major credit: EGC 671—Introduction to Plasmas; EGC 672—Plasma Theory.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

NES 530—Applications of Nuclear Radiation Techniques 3 credits
NES 540—Nuclear Radiation Detection and Instrumentation. 4 credits
NES 551—Nuclear Power Reactors 1. 4 credits

## GRADUATE COURSES

NES 600—Nuclear Engineering Laboratory 2. 4 credits

Prerequisites: NES 404, NES 540. Corequisite: NES 610. Laboratory practice in neutron and gamma detection and analysis. Determination of basic neutron parameters in nonmultiplying and multiplying media.

NES 601—Nuclear Engineering Laboratory 3. 4 credits

Continuation of NES 600. Laboratory practice in measurement of basic reactor parameters and the effects of reactor perturbation.

NES 610—Reactor Analysis 1. 3 credits

Prerequisites: NES 401, NES 402, NES 403. Neutron diffusion theory, homogeneous and one-velocity reactors. Time-dependent behavior of the neutron flux, reactor kinetics with temperature dependence.

NES 611—Reactor Analysis 2. 3 credits

Prerequisite: NES 610. Fundamentals of reactor analysis in terms of the slowing-down model and Fermi-age theory. Six-factor formula, reactor temperature coefficients, introduction to perturbation theory as applied to reactivity calculations.

NES 612—Advanced Reactor Analysis. 3 credits

Prerequisite: NES 611. Analytical methods of heterogeneous reactor calculations, fundamentals of control-rod theory, disadvantage factor, thermal utilization, resonance escape probability, fast fission; monoenergetic transport theory.

NES 614—Neutron Transport Theory. 3 credits

Prerequisite: NES 612. Formal aspects of the neutron transport equation, approximations based on orthogonal functions, variational techniques and Monte Carlo methods applied to monoenergetic and energy dependent transport theory.

NES 616—Numerical Methods of Reactor Analysis. 4 credits

Prerequisite: NES 610. Corequisite: NES 612. Numerical solutions to reactor analysis problems, emphasis on the solution of one-, two- and three-dimensional diffusion equations, multiregion and multigroup diffusion methods, $P_N$ and $S_N$ calculations.

NES 618—Fast Reactor Physics 1. 3 credits

Prerequisite: NES 612. Underlying mathematical techniques of fast reactor physics. Quantum mechanical procedures for nuclear processes involved in a fast reactor. Inelastic neutron scattering and resonance reactions.

NES 619—Fast Reactor Physics 2. 3 credits

Prerequisite: NES 618. Computation of sodium void, Doppler and temperature coefficients, and fast reactor breeding ratio. Problems of fast reactor breeding. Time-of-flight cross section measurements, die-away and neutron wave propagation techniques.

NES 632—Nuclear Processing and Radiations 1. 3 credits
Prerequisite: NES 403. Chemical processing of fertile and fissile materials, irradiated fuel. Study of isotope separations and use of reactors and integrated energy sources for chemical plants.

NES 633—Nuclear Processing and Radiations 2. 3 credits
Prerequisite: NES 632. Continuation of NES 632.

NES 635—Interaction of Radiation with Matter. 3 credits
Prerequisites: PS 305, NES 530. Interaction of radiation with matter. Application of radiation techniques to fundamental research problems.

NES 642—Hybrid Computational Techniques in Nuclear Engineering Sciences. 3 credits
Prerequisite: IG 551 or consent of instructor. Use of analog and digital computers coupled together. High-speed information transfer and storage. Application to problems in nuclear engineering sciences.

NES 644—Nuclear Data Acquisition and Processing. 4 credits
Prerequisites: NES 404, NES 540. Acquisition and processing of data from nuclear detectors. Multi-input systems. Use of "on-line" digital computers for control of experiments. Special instrumentation techniques.

NES 651—Nuclear Power Reactors 2. 4 credits
Prerequisites: NES 403, NES 551, NES 610. A study of various types of nuclear reactors for power generation with emphasis on use of computer codes and an advanced set of problems.

NES 652—Reactor Technology 1. 3 credits
Prerequisites: NES 610, NES 611. The theories obtained in previous courses will be applied to an analytical design and economics of an integrated nuclear plant.

NES 653—Reactor Technology 2. 3 credits
Prerequisite: NES 652. An analysis of reactor systems by comparison of actual and predicted performance, with emphasis on use of computer codes.

NES 654—Special Nuclear Materials. 3 credits
Prerequisites: NES 402, NES 403. A theoretical and applied study of special materials used in all types of reactors; changes in properties due to radiation corrosion and other deteriorating mechanisms.

NES 655—Fundamental Aspects of Reactor Shielding. 3 credits
Prerequisite: NES 611. An analytic study of shielding design fundamentals. Methods of calculating gamma-ray attenuation, fast neutron penetration, effects of ducts and voids in shields, problems of heat generation and deposition in reactor components.

NES 656—Reactor Fuel Cycles. 3 credits
Prerequisite: NES 611. Changes in concentration of uranium and plutonium nuclei and fission products. Changes in radioactivity of nuclear fuel during reactor operation. Plutonium recycle.

NES 658—Nuclear Rocket Propulsion. 3 credits
Prerequisites: NES 610, NES 611. Requirements of propulsion systems, materials, heat transfer and fluid flow.

NES 660—Fundamentals of Reactor Kinetics. 4 credits
Prerequisite: NES 611. The dynamic behavior of nuclear reactor systems from the point of view of linear control theory. Laboratory involves use of analog computer to study reactor kinetics problems.

NES 661—Advanced Reactor Kinetics. 3 credits
Prerequisite: NES 660. Advanced topics in nuclear reactor dynamics, spatially

dependent kinetics, techniques of non-linear stability analysis and kinetics of various reactor prototypes.

NES 662—Stochastic Processes in Nuclear Systems. 3 credits

Application of random noise techniques to the evaluation of nuclear reactor parameters. Auto- and cross-correlation functions and power and cross spectral density analysis.

NES 670—Plasma Spectroscopy. 4 credits

Spectroscopic techniques for measurement of temperature and density of plasmas, and their application to thermonuclear fusion and direct energy conversion devices.

NES 672—Advanced Plasma Theory. 4 credits

Prerequisite: NES 670. Discussion of fundamental equations of statistical plasma theory (Vlasov, Boltzmann, Fokker-Planck and radiation transport equations, their solution, and typical applications to plasmas).

NES 674—Thermonuclear Fusion. 3 credits

Foundations of thermonuclear reactions. Methods of heating plasmas to extreme temperatures; plasma containment by magnetic fields; plasma instabilities.

NES 678—Direct Energy Conversion. 4 credits

Prerequisite: Consent of instructor. A theoretical and applied study of various direct conversion systems with emphasis on systems involving nuclear reactors or nuclear reactions.

NES 690—Nuclear Seminar. 1 credit

Discussion of topics in fields of graduate study and research. May be repeated with change of content up to a maximum of 18 credits.

NES 691—Special Projects in Nuclear Engineering Sciences. 1 to 9 credits

Non-thesis research projects. May be repeated with change of content up to a maximum of 18 credits.

NES 692—Special Topics in Nuclear Engineering Sciences 1 to 9 credits

Laboratory, lectures or conferences covering selected topics in nuclear engineering sciences. May be repeated with change of content up to a maximum of 18 credits.

NES 694—Individual Work. 1 to 6 credits

Supervised study or research in areas not covered by other graduate courses. May be repeated with change of content up to a maximum of 18 credits.

NES 699—Master's Research. 0 to 9 credits. Maximum 24 credits

NES 799—Doctoral Research. 1 to 12 credits

# COLLEGE OF HEALTH RELATED PROFESSIONS

## HEALTH AND HOSPITAL ADMINISTRATION

(See COLLEGE OF BUSINESS ADMINISTRATION)

## REHABILITATION COUNSELING

# REHABILITATION COUNSELING

## GRADUATE FACULTY 1966-67

THOMASON, B., *Chairman*; BARRETT, A. M.; STONE, J. T.

## GRADUATE COURSES

RC 600—AN INTRODUCTION TO REHABILITATION COUNSELING. 4 credits

An orientation to the rehabilitation process, including a survey of history, principles, philosophy and legal aspects of rehabilitation and related fields.

RC 601—PSYCHOLOGICAL AND SOCIOLOGICAL ASPECTS OF REHABILITATION COUNSELING. 5 credits

A study of social and personal problems of the handicapped; psychological aspects of physical and mental disabilities.

RC 602—OCCUPATIONAL ANALYSIS AND PLACEMENT ASPECTS OF REHABILITATION COUNSELING. 4 credits

The vocational structure of society, occupational skills, occupational entry requirements and physical and emotional demands. Adaption of occupational information to rehabilitation counseling, including job analysis, placement and follow-up techniques.

RC 603—MEDICAL AND RELATED ASPECTS OF REHABILITATION COUNSELING. 5 credits

Medical implications for rehabilitation counselors, including anatomy, physiology and pathology of human systems, physical restoration and etiology, prognosis and therapy of the various disabling conditions.

RC 604—REHABILITATION EVALUATION AND COUNSELING WITH THE DISABLED. 5 credits

Prerequisites: PSY 503 or EDP 613; PSY 637 or EDP 610. Application of evaluation and counseling theory and technique to the rehabilitation of the disabled. Familiarization with theory and practice of selected approaches in counseling the disabled, with emphasis on techniques in practical situations; interviewing and specific testing procedures as vehicles of counseling. Limited classroom experience in counseling will be provided.

RC 630—INDIVIDUAL WORK. 3 credits

Prerequisite: Permission of department. A special problem and reading course allowing graduate students in rehabilitation counseling to pursue work not available in other courses. May not be repeated.

RC 644—RESEARCH IN VOCATIONAL REHABILITATION. 4 credits

Prerequisites: STA 320 or EDF 360, consent of instructor.

RC 645—PRACTICUM IN REHABILITATION COUNSELING. 3 to 6 credits

Prerequisite: Consent of instructor. Supervised individual counseling. May be repeated with change of content up to a maximum of 6 credits.

RC 646—INTERNSHIP IN REHABILITATION COUNSELING. 10 credits

Supervised field work in a recognized rehabilitation facility, including counseling, case studies, contacts with community social agencies and the vocational placement of disabled individuals. No student will be allowed to begin internship until 36 credits of degree requirement have been completed.

# COLLEGE OF MEDICINE

BIOCHEMISTRY

BIOLOGICAL SCIENCES

(See Biological Sciences)

MEDICAL SCIENCES

General

Anatomy

Biochemistry

Microbiology

Pathology

Pharmacology

Physiology

Radiology

PHARMACOLOGY

# BIOCHEMISTRY

## GRADUATE FACULTY 1966-67

DEMPSEY, W. B.; FRIED, M.; KITCHEN, H.; KOCH, A. L.

*Prerequisites:* Since biochemistry is a multi-disciplinary field, the undergraduate major may be related biological and physical sciences. Required courses include general, organic, quantitative and physical chemistry and at least 8 credits in physics and in biology. Calculus is recommended. Prebaccalaureate courses in biochemistry are not accredited for the graduate program. Any deficiency in the prerequisites must be satisfied as soon as possible after entering Graduate School.

Doctoral candidates are required to take a core of biochemistry courses including BCH 601, BCH 602, BCH 603, BCH 604 (or MED 511, MED 512), and BCH 612, BCH 613, BCH 614, BCH 615, BCH 616 and BCH 617. The minor will generally be chemistry but may also be taken in such related fields as psysiology, microbiology, pharmacology and physics. The graduate program should include advanced physical and organic chemistry, human physiology and microbiology.

## GRADUATE COURSES*

* BCH courses numbered 612 through 617 are identical with MED courses of the same numbers.

BCH 601—PRINCIPLES OF BIOCHEMISTRY 1. 3 credits

Prerequisite: Organic chemistry. Corequisite: BCH 603 (except by special arrangement). The chemistry, metabolism and regulation of cellular constituents. Introduction to proteins, carbohydrates, lipids, enzymes and problems of energy transfer and intermediary metabolism.

BCH 602—PRINCIPLES OF BIOCHEMISTRY 2. 3 credits

Continuation of BCH 601.

BCH 603—LABORATORY METHODS OF BIOCHEMISTRY 1. 2 credits

Corequisite: BCH 601. Introduction to laboratory methods including colorimmetry, spectrophotometry, chromatography, cellular fractionation and techniques of enzymology. Experiments in intermediary metabolism and introduction to isotopic methods.

BCH 604—LABORATORY METHODS OF BIOCHEMISTRY 2. 2 credits

Continuation of BCH 603. Corequisite: BCH 602.

BCH 612—PHYSICAL BIOCHEMISTRY. 4 credits

Prerequisites: MED 511, MED 512 or BCH 601, BCH 602, BCH 603, BCH 604; physical chemistry (may be taken concurrently with permission). The physical chemistry and molecular structure of proteins, nucleic acids, enzymes and metabolites. Biochemical methods, tracer techniques and bioenergetics.

BCH 613—CHEMICAL BIOLOGY. 4 credits

Prerequisites: MED 511, MED 512 or BCH 601, BCH 602, BCH 603, BCH 604. A survey of chemical and physicochemical aspects of gene replication, mutation and heredity, of embryological development, growth and senescence, and the comparative biochemistry and metabolism of living organisms.

BCH 614—Advanced Intermediary Metabolism. 4 credits
Prerequisites: MED 511, MED 512 or BCH 601, BCH 602, BCH 603, BCH 604. Current aspects of the intermediary metabolism of nitrogen, carbohydrate and fat. Bio-organic mechanisms of enzyme action, the endocrines, and metabolic balance.

BCH 615—Research Methods in Biochemistry. 2 to 6 credits
Prerequisites: MED 511, MED 512 or BCH 601, BCH 602, BCH 603, BCH 604; only by special arrangement. An introduction to biochemical research in which the student acquires proficiency in research techniques used in physical biochemistry, intermediary metabolism, radio-isotopes, etc., under supervision of a staff member. May be repeated with change of content up to a maximum of 12 credits.

BCH 616—Biochemistry Seminar. 1 credit
Required of graduate students in biochemistry; open to others by special arrangement. Research reports and discussions of current research literature given by the departmental staff, invited speakers and graduate students.

BCH 617—Special Topics in Biochemistry. 2 credits
Prerequisite or corequisite: BCH 612, BCH 613, or BCH 614. Supervised study in journals, treatises, and monographs of various subject areas of biochemistry, with informal weekly conferences and reports. May be repeated with change of content up to a maximum of 6 credits.

BCH 699—Master's Research. 0 to 9 credits. Maximum 24 credits

BCH 799—Doctoral Research. 1 to 12 credits

# MEDICAL SCIENCES—GENERAL

Programs leading to the Doctor of Philosophy degree in the basic medical sciences with a major in anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology are offered by the College of Medicine. A separate Doctor of Philosophy degree is offered in biochemistry. In addition a program in radiation biophysics leading to a Master of Science degree is available. Training in these scientific disciplines is planned to prepare the student for a career in research and teaching, rather than in clinical practice for which the Doctor of Medicine degree program is designed. The minor field may be chosen in another of the basic sciences listed or elsewhere in the University. All facilities of the College of Medicine are available to graduate students in this program. Though an undergraduate major in biological or physical science is desirable, concentration in mathematics or engineering is an appropriate foundation for the Doctor of Philosophy degree in medical sciences. Satisfactory completion of a thesis based on research is a requirement for a graduate degree in the medical sciences (see *College of Medicine Catalog*). A joint program with the Division of Biological Sciences (see Biological Sciences) is available in the field of molecular and cellular biology.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MED 531—Introduction to Medicine 1. 3 credits

MED 532—Introduction to Medicine 2. 2 credits

## GRADUATE COURSES

MED 630—Research in Medical Sciences. 1 to 9 credits
Supervised research other than that toward fulfillment of the thesis or dissertation

in departments of anatomy, biochemistry, microbiology, pathology, physiology, pharmacology and radiation biophysics. May be repeated with change of content up to a maximum of 9 credits.

MED 699—Master's Research: Anatomy, Biochemistry, Microbiology, Pathology, Pharmacology and Radiation Biophysics.
0 to 9 credits. Maximum 24 credits

MED 799—Doctoral Research: Anatomy, Biochemistry, Microbiology, Pathology and Physiology. 1 to 12 credits

# MEDICAL SCIENCES—ANATOMY

## GRADUATE FACULTY 1966-67

Goodman, D. C., *Chairman*; Callahan, W. P. III; Gavan, J. A.; Horel, J. A.; Johnson, E. M.

Students expecting to do graduate study with a major in anatomy should ordinarily have completed courses in general zoology, comparative anatomy, embryology or genetics, general chemistry, organic chemistry and general physics, but reasonable substitutions may be made with departmental approval. Doctoral candidates are required to take MED 501, MED 502, MED 503, MED 504. The minor will usually be taken in physiology, pathology, biology, biochemistry, psychology or microbiology.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MED 501—Gross anatomy 1. 6 credits
MED 502—Gross Anatomy 2. 7 credits
MED 503—Microscopic Anatomy. 6 credits
MED 504—Neuroanatomy. 6 credits

## GRADUATE COURSES

MED 602—Teratology. 2 credits
Prerequisite: ZY 309, or MED 609, or corequisite MED 501. Survey of causes, incidence and manifestations of congenital malformations in experimental animals and in man. May be repeated with change of content up to a maximum of 4 credits.

MED 603—Comparative Neurology. 3 credits
Prerequisite: MED 504 or MED 633. The phylogenetic development of the central nervous system of vertebrate animals considered from the behavioral, anatomical and physiological points of view.

MED 604—Advances in Submicroscopic Anatomy. 3 credits
Prerequisite: Course in histology or cytology and approval of the staff. Presents current knowledge of ultrastructure in cells and tissues of vertebrate forms. Current research trends and functional connotations emphasized where pertinent.

MED 605—Research Methods in Anatomy. 1 to 6 credits
Proficiency acquired in the research techniques of histochemistry, radiation biology, experimental embryology, teratology, experimental neurology, endocrinology or electron microscopy under supervision of a staff member. May be repeated with change of content up to a maximum of 12 credits.

MED 606—Anatomy Seminar. 1 credit
Research reports and discussions of current research literature by departmental staff and graduate students.

MED 607—Hematology. 2 credits
Prerequisite: MED 503. The morphology, biochemistry and physiology of human blood and blood-forming tissues.

MED 608—Special Topics in Anatomy. 1 to 6 credits
Readings and organized study in the recent research literature of anatomy and allied disciplines. May be repeated with change of content up to a maximum of 15 credits.

MED 609—Embryology and Organogenesis. 2 credits
Prerequisite: ZY 309 or MED 501. Survey of human and higher mammalian development with emphasis on maldevelopment. Physiological and clinical considerations stressed where pertinent.

MED 631—Postnatal Physical Growth 3 credits
Prerequisite: Background in life sciences. Changes in size, proportion and other physical characteristics from birth to adulthood in human and nonhuman primates.

MED 632—Techniques in Election Microscopy 3 or 4 credits
Prerequisites: Courses in histology and cytology. Proficiency acquired in techniques of specimen preparation and analysis for ultrastructure investigation and in use of the ultramicrotome, high vacuum evaporator and electron microscope.

MED 633—Neurobiology. 3 credits
Prerequisites: Consent of instructor and background in biological or behavioral sciences. Introduction to the structure and physiology of the nervous system as it pertains to control of behavior.

MED 634—Experimental Teratology. 4 credits
Prerequisites: Course in embryology and approval of the faculty. Laboratory experience in the effects of teratogenic agents on development.

# MEDICAL SCIENCES—BIOCHEMISTRY

## GRADUATE FACULTY 1966-67

Dempsey, W. B.; Fried, M.; Kitchen, H.; Koch, A. L.

*Prerequisites:* Since biochemistry is a multi-disciplinary field, the undergraduate major may be in related biological and physical sciences. Required courses include general organic, quantitative and physical chemistry and at least 8 credits in physics and in biology. Calculus is recommended. Prebaccalaureate courses in biochemistry are not accredited for the graduate program. Any deficiency in the prerequisites must be satisfied as soon as possible after entering Graduate School.

Doctoral candidates are required to take a core of biochemistry courses including BCH 601, BCH 602, BCH 603, BCH 604 (or MED 511, MED 512), MED 612, MED 613, MED 614, MED 615, MED, 616, MED 617. The minor will generally be chemistry but may also be taken in such related fields as physiology, microbiology, pharmacology and physics. The graduate program should include advanced physical and organic chemistry, human physiology and microbiology.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES*

* MED courses numbered 612 through 617 are identical with BCH courses of the same numbers.

MED 511—Biochemistry 1. 6 credits
MED 512—Biochemistry 2. 6 credits

### GRADUATE COURSES

MED 612—Physical Biochemistry. 4 credits
Prerequisites: MED 511, MED 512 or BCH 601, BCH 602 and BCH 603, BCH 604; physical chemistry (may be taken concurrently with permission). The physical chemistry and molecular structure of proteins, nucleic acids, enzymes and metabolites. Biochemical methods, tracer techniques and bioenergetics.

MED 613—Chemical Biology. 4 credits
Prerequisites: MED 511, MED 512 or BCH 601, BCH 602, and BCH 603, BCH 604. A survey of chemical and physiochemical aspects of gene replication, mutation and heredity, of embroyological development, growth and senescence, and of the comparative biochemistry and metabolism of living organisms.

MED 614—Advanced Intermediary Metabolism. 4 credits
Prerequisites: MED 511, MED 512 or BCH 601, BCH 602 and BCH 603, BCH 604. Current aspects of the intermediary metabolism of nitrogen, carbohydrate and fat. Bioorganic mechanisms of enzyme action, the endocrines and metabolic balance.

MED 615—Research Methods in Biochemistry. 2 to 6 credits
Prerequisites: MED 511, MED 512 or BCH 601, BCH 602 and BCH 603, BCH 604. Only by special arrangement. An introduction to biochemical research in which the student acquires proficiency in research techniques used in physical biochemistry, intermediary metabolism, radioisotopes, etc., under supervision of a staff member. May be repeated with change of content up to a maximum of 12 credits.

MED 616—Biochemistry Seminar. 1 credit
Required of graduate students in biochemistry; open to others by special arrangement. Research reports and discussions of current research literature are given by the departmental staff, invited speakers and graduate students.

MED 617—Special Topics in Biochemistry. 2 credits
Prerequisite or corequisite: MED 612, MED 613, or MED 614. Supervised study in journals, treatises and monographs in various subject areas of biochemistry with informal weekly conferences and reports. May be repeated with change of content up to a maximum of 6 credits.

## MEDICAL SCIENCES—MICROBIOLOGY

### GRADUATE FACULTY 1966-67

Small, Parker A., Jr., *Chairman*; Cebra, J. J.; Crandall, R. B.; Gifford, G. E.; Koch, A. L.; Previc, E.; Robbins, J. B.; Shands, J. W.; Suter, E.

The Department of Microbiology offers a program leading to the Master of Science and Doctor of Philosophy degrees in microbiology, including the field of parasitology. Through individual planning of course work, research and teaching, the graduate student is offered an educational atmosphere to

help him develop certain skills and gain intellectual independence and initiative. The program is in close collaboration with the Department of Bacteriology in the College of Agriculture.

The undergraduate preparation for graduate study in microbiology should be wide in scope and should include general biology, physics, chemistry (2 to 3 years, including organic and quantitative analysis) and preferably statistics, calculus, physical chemistry, genetics and bacteriology. A bachelor's degree in bacteriology or microbiology is not required. In Graduate School the student will at first obtain a general background in microbiology as preparation for research and teaching. The remaining course work should be arranged according to the student's interests and competence. Emphasis is placed on the following areas: bacterial physiology, general virology, immunology, parasitology and infectious diseases. The minor requirement is frequently taken in the Department of Biochemistry.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MED 551—Microbiology. 7 credits
MED 554—Medical Parasitology. 2 credits

## GRADUATE COURSES

MED 650—Public Health Microbiology. 1 to 6 credits

Identical with BCY 650. Prerequisites: Permission of chairman of department and director of laboratories. Reference study and laboratory practice of diagnostic techniques in the Microbiology Diagnostic Laboratories of the Shands Teaching Hospital of the University of Florida Health Center, or in residence at the Bureau of Laboratories, State Department of Health, Jacksonville. May be repeated with change of content up to a maximum of 18 credits.

MED 651—Special Topics in Microbiology. 3 credits

Identical with BCY 651. Prerequisite: 6 credits in graduate major courses. Organized study of contemporary research in a particular aspect of general microbiology. May be repeated with change of content up to a maximum of 6 credits.

MED 652—Virology. 3 credits

Identical with BCY 652. Discussion of selected topics on modern concepts of the nature of viruses and mechanisms of viral infection, chosen from the field of animal, bacterial and plant viruses.

MED 653—Virology Laboratory. 3 credits

Identical with BCY 653. Prerequisite or corequisite: MED 652. Selected laboratory experiments on the nature of viruses and mechanisms of viral replication, as well as other consequences of viral infections.

MED 654—Research Planning. 3 credits

Identical with BCY 654. Prerequisite: 20 credits in progressive study of microbiology. An outline of the processes involved in scientific research, including initating a problem, experimental techniques, analysis and evaluation of data, and reporting, illustrated by bacteriological examples.

MED 655—Experimental Microbiology. 2 to 5 credits

Identical with BCY 655. Prerequisites: 12 credits of microbiology and consent of instructor. Application of physical, chemical and biological techniques to experimental problems in microbiology. Individual laboratory study under supervision. May be repeated with change of content up to a maximum of 8 credits.

MED 656—The Literature of Microbiology. 3 credits

Identical with BCY 656. Prerequisites: 12 credits of microbiology and consent of instructor. Bibliographic method in searching the literature. The literature of specified areas of the discipline.

MED 657—Microbial Metabolism. 5 credits

Identical with BCY 657. Prerequisites: BCH 601, BCH 603. The intermediary metabolism of microorganisms; emphasizes those metabolic pathways that are unique or characteristic primarily of microorganisms.

MED 658—Microbial Physiology. 5 credits

Identical with BCY 658. Prerequisite: MED 657 or consent of instructor. The structural and functional elements of microorganisms and the mechanics of their regulatory systems. Mechanisms of control of microbial DNA replication, cell division, ribosome and cell-wall formation; kinetic studies of normal and abnormal growth.

MED 659—Principles of Immunology. 3 credits

Identical with BCY 659. Prerequisite: BCY 505 or MED 551. Biological and biochemical aspects of host resistance and immunity, with special emphasis on the chemical and physicochemical properties of the proteins of immune reactions.

MED 660—Immunology Laboratory. 3 credits

Identical with BCY 660. Corequisite: MED 659. Consent of staff is required for registration.

MED 661—Biology of Uncommon Microorganisms. 5 credits

Identical with BCY 661. Prerequisites: BCY 305, BCY 306, consent of instructor. Natural distribution, metabolic activities, isolation and culture of selected groups of microorganisms.

MED 662—Microbial Genetics. 5 credits

Prerequisites: BCY 520, BCY 521, general genetics. Microbial genetics, including mutation, selection, transformation, transduction, conjugation and episomal factors; molecular structure and function of genes.

MED 663—Parasitic Diseases of the Tropics and Subtropics. 5 credits

Identical with BCY 663 and VY 663. A course in animal parasitology covering the mechanisms of parasitic infections, the physiology of parasites and the immune responses of the host; public health, veterinary and general aspects of various parasites affecting man and animals. Laboratory work includes experiments showing the effects of nutrition on parasites; immune responses, factors and modes of transmission; life cycles; morphology.

MED 669—Seminar. 1 credit

Identical with BCY 669. Attendance is required of all graduate majors at one research presentation and one graduate report each week as scheduled. May be repeated with change of content.

## MEDICAL SCIENCES—PATHOLOGY

### GRADUATE FACULTY 1966-67

Edwards, J. L., *Chairman*; Collins, G. H.; Lambert, R. M.; Savory, J.; Sunderman, F. W., Jr.; Woodard, C.

*Prerequisites:* Students entering this program will be required to have the following undergraduate courses: general chemistry, organic chemistry, general physics, general biology and two or more advanced courses in the area of physiological, developmental or cellular biology, or, in the case of students

in clinical chemistry, courses in analytical or physical chemistry. Students may find it necessary to remedy deficiencies in their background by taking some undergraduate courses after admission to the Graduate School.

All students in this program will be required to take MED 503, MED 511 and MED 561. Other courses in the major program will be determined by the graduate student's advisory committee. The minor may be taken in any appropriate area.

*Thesis:* Satisfactory completion of a thesis based on research is a requirement for a graduate degree.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MED 561—General Pathology. 4 credits
MED 562—Systemic Pathology 1. 5 credits
MED 564—Systemic Pathology 2. 4 credits
MED 565—Systemic Pathology 3. 6 credits

### GRADUATE COURSES

MED 640—Clinical Chemistry and Toxicology. 3 credits
Emphasizes the chemical techniques undertaken for the diagnosis of disease. Attention also focused upon methods of toxicology.

MED 641—Special Cytology. 5 credits
Detailed studies of particular types of cells such as nerve, secretory, bone, muscle, connective tissue, blood and lymphoid cells.

MED 642—Immunohematology. 3 credits
Immunologic, genetic and anthropologic significance of blood group antigens and antibodies with emphasis on their serologic and immunochemical characteristics.

MED 643—Clinical Chemistry and Toxicology Rotation 1. 10 credits
Prerequisite: Consent of instructor. Participation in all phases of practical clinical chemistry and toxicology. Chemical methodology, clinical interpretation and significance of laboratory measurements for the diagnosis of the sick. Each student will participate in an investigative project in clinical chemistry and toxicology. Students specializing in clinical chemistry must spend three terms on this rotation.

MED 644—Clinical Chemistry and Toxicology Rotation 2. 10 credits
Prerequisite: MED 643. Continuation of MED 643.

MED 645—Clinical Chemistry and Toxicology Rotation 3. 10 credits
Prerequisite: MED 644. Continuation of MED 644.

MED 646—Special Topics in Pathology. 1 to 6 credits
Prerequisite: Permission of department. Supervised conferences and laboratory work. Study of selected topics to meet each student's needs. May be repeated with change of content up to a maximum of 18 credits.

MED 647—Seminar in Pathology. 1 credit
Required of graduate students in pathology; open to others by permission of the department. Discussions of current research literature and research reports by graduate students, department staff and invited speakers.

## MEDICAL SCIENCES—PHARMACOLOGY

### GRADUATE FACULTY 1966-67

Maren, T. H., *Chairman*; Anton, A. H.: Byvoet, P.; Fox, L. E.; Leibman, K. C.; Voss, E.

Students entering the course of study for the degree of Ph.D. in Medical Sciences with major in pharmacology should present undergraduate course credits in chemistry, including quantitative, analytical, organic and physical chemistry; elementary physics and biology, and mathematics through the calculus. Otherwise well-qualified students with certain deficiencies in preparation may be allowed to make these up during the first year of graduate study. In addition to elementary and advanced study in pharmacology, candidates will pursue courses in biochemistry, physiology, and other medical sciences as determined by consultation with their advisory committees.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

MED 560—Pharmacology. 6 credits
MED 566—Advanced Medical Pharmacology. 6 credits

### GRADUATE COURSES

MED 670—Topics in Pharmacology. 0 to 4 credits
Seminars and informal conferences on the use of drugs in biochemical and physiological investigations. May be repeated with change of content up to a maximum of 12 credits.

MED 671—Theoreticial Pharmacology. 5 credits
Prerequisites: MED 560, CY 342. Physical, physicochemical, and mathematical aspects of pharmacology, including the theory of drug-receptor complexes, transport and distribution kinetics and equilibria, and the kinetics of enzyme inhibition by drugs.

MED 672—Chemical Pharmacology. 5 credits
Prerequisite: MED 560. Chemical aspects of several areas of modern pharmacology, such as metabolism of foreign compounds, structure-activity relationships, the biochemistry of drug activity.

MED 673—Recent Advances in Pharmacology. 5 credits
Prerequisite: MED 560. Advanced study of several special areas of modern pharmacology in which recent significant advances have been made.

MED 674—Seminar in Pharmacology. 1 credit
Prerequisite: MED 560. Research reports and discussions of current research literature by graduate students, faculty and invited lecturers.

## MEDICAL SCIENCES—PHYSIOLOGY

### GRADUATE FACULTY 1966-67

Otis, A. B., *Chairman*; Belkin, D. A., Cassin, S.; Fregly, M. J.; King, R. L.; Stainsby, W. N.; Wright, E. B.

*Prerequisites:* Undergraduate majors that are appropriate foundations for the study of physiology are biology, chemistry, engineering, mathematics or physics. The following courses are especially useful as a background for the study of physiology: general biology, vertebrate biology, general chemistry, analytical chemistry, organic chemistry, physical chemistry, general physics, calculus and statistics. Students usually find it necessary to remedy deficiencies in their background by taking a few undergraduate courses after admission to Graduate School.

*Course requirements*: Most students will take the following unless equivalent courses have been taken elsewhere: MED 503, MED 504, BCH 601, BCH 602, BCH 603, BCH 604, MED 520, MED 623, MED 624, MED 625, MED 626, MED 627, MED 628 and MED 629. The minor field of study may be in another department of the College of Medicine, such as anatomy, biochemistry or microbiology, or elsewhere in the University in such departments as zoology, chemistry, physics or psychology.

*Thesis:* Satisfactory completion of a thesis based on research is a requirement for a graduate degree. The research may be carried out in any of a number of areas of physiology, including neurophysiology, endocrinology, respiration, circulation, physiology of muscle, environmental physiology, comparative physiology and neonatal physiology.

### COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

MED 520—Principles of Physiology. 12 credits

### GRADUATE COURSES

MED 621—Renal Physiology. 3 credits
Prerequisite: MED 520. Comparative physiology aspects of renal structure and function covered in seminars.

MED 622—Physiology of the Central Nervous System. 3 credits
Prerequisite: MED 520. Special and current problems in brain and spinal cord function covered in seminars.

MED 623—Neurophysiology. 3 credits
Prerequisite: MED 520. Physiology of nerve and muscle, central nervous system and the special senses. Comparative aspects of the subject emphasized.

MED 624—Respiration and Circulation. 3 credits
Prerequisite: MED 520. Special and current topics in respiratory and circulatory physiology covered in seminars.

MED 625—Body Temperature Regulation. 3 credits
Prerequisite: MED 520. Neural and endocrine aspects of temperature regulation, hypo- and hyper-thermia, adaptation to cold and heat, hibernation. Comparative physiology of temperature regulation stressed.

MED 626—Recent Advances in Physiology. 3 credits
Prerequisite: MED 520. The detailed content of this seminar varies from year to year, but covers recent advances in selected areas of physiology. May be repeated with change of content up to a maximum of 15 credits.

MED 627—Research Methods in Physiology. 2 to 6 credits
The special needs of each student met by conferences and laboratory work. May be repeated with change of content up to a maximum of 9 credits.

MED 628—Seminar in Physiology. 1 credit

MED 629—Neonatal Physiology. 3 credits
Prerequisite: MED 520. Selected aspects of the development of physiological regulation in newborn mammals.

## MEDICAL SCIENCES—RADIOLOGY

### GRADUATE FACULTY 1966-67

Williams, C. M., *Chairman*; Cromroy, H. L.; Dunavant, B. G.; Mauderli, W.

The Department of Radiology offers a program leading to the Master of Science degree in radiation biophysics.

*Prerequisites:* The basic requirement for admission to the graduate program is a bachelor's degree in an approved program in mathematics, engineering, or the physical or biological sciences. The following courses are considered especially useful as background for the study of radiation biophysics: general chemistry, general and modern physics, statistics, general biology and organic chemistry. Calculus is highly recommended.

*Course requirements:* Most students will be required to take MED 680, MED 681, MED 682, MED 684, MED 685 and MED 689 unless equivalent courses have been taken elsewhere. MED 699 is required for all students majoring in radiation biophysics.

*Thesis:* Satisfactory completion of a thesis based on research is required for an M.S. degree in radiation biophysics.

## GRADUATE COURSES

MED 680—Radiological Physics. 2 credits

X-ray generators including high-energy electron accelerators and interaction of electromagnetic radiation with matter relative to medical radiology.

MED 681—Health Physics. 4 credits

Literature and philosophy; hazard evaluation and radiation control; monitoring methods; survey techniques; biological sampling; instrument calibration; exposure standards and radiation protection regulation; on-site radiation safety surveys and evaluation.

MED 682—Nuclear, X-Ray Instrumentation and Dosimetry. 4 credits

Electronics of diagnostic and therapeutic x-ray units; image amplifying tubes, video equipment in diagnostic radiology; preamplifiers; linear amplifiers; scalers; single and multichannel analyzers used in nuclear medicine; dosimeter instrumentation used in diagnosis and therapy; measurement in terms of roentgens; and measurement of absorbed radiation energy.

MED 683—Radioactive Tracer Methodology in Radiology. 4 credits

Prerequisite: BTY 565 or consent of instructor. Analytical use of radioisotopes and activation analysis; beta and gamma ray spectrometry; beta and gamma ray liquid scintillation detectors; sample preparation; data analysis and efficiency calculations; total-body counters.

MED 684—Radiation: Uses in Diagnosis and Treatment of Disease; Effects on Humans. 4 credits

Prerequisites: MED 680, MED 682 or consent of instructor. Somatic and genetic radiation effects; acute and chronic radiation exposure; psychological and epidemiological aspects; radiation legislation; fundamentals of the application of radiation in medicine.

MED 685—Computer Applications in Medicine. 4 credits

Prerequisite: Consent of instructor. Corequisite: FORTRAN programming course. Review of programming fundamentals (including use of computer at Computing Center), medical problems, data preparation and representation, simulation, information retrival, problems in radiation biophysics with emphasis on radiation treatment planning.

MED 687—Problems in Radiation Biophysics. 3 credits

Selected topics dealing with radiation physics and radiation biology. May be repeated with change of content up to a maximum of 6 credits.

MED 689—Seminar in Radiation Biophysics. 1 credit
Required of graduate students in radiation biophysics; open to others by permission of the department. Discussions on topics in fields of graduate study and research. May be repeated with change of content up to a maximum of 3 credits.
MED 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# PHARMACOLOGY

## GRADUATE FACULTY 1966-67

Maren, T. H., *Chairman*; Anton, A. H.; Byvoet, P.; Fox, L. E.; Leiman, K. C.; Voss, E.

Prerequisite undergraduate training is described under "Medical Sciences—Pharmacology."

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

PLY 552—Principles of Endocrinology. 5 credits

## GRADUATE COURSES

PLY 607—Advanced Pharmacology. 5 credits
Theories of drug action.
PLY 608—Advanced Pharmacology. 5 credits
Continuation of PLY 607.
PLY 609—Advanced Pharmacology Laboratory. 1 credit
Laboratory for PLY 607.
PLY 610—Advanced Pharmacology Laboratory. 1 credit
Laboratory for PLY 608.

COLLEGE OF NURSING

# NURSING

## GRADUATE FACULTY 1966-67

SMITH, D. M., *Dean*; BARTON, P. H.; DYKES, E. E.; KORDANA, J. H.; LUTHER, D. L.; MERCADANTE, L. T.; O'BRIEN, J. M.; WHITNER, W.; WILSON, J. M.

In addition to the requirements of the Graduate School, prerequisite for admission to graduate study in nursing is a bachelor's degree from an approved program in nursing. The student should have completed basic psychiatric nursing theory and experience and public health nursing theory and experience as part of his undergraduate work. Should he be deficient in this respect, the student will be expected to fulfill these requirements before he can be officially admitted to the graduate program in nursing. This work will be taken as foundation work with no graduate credit.

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

NSG 511—SEMINAR IN GENERAL NURSING. 4 credits

NSG 561—PRACTICUM IN GENERAL NURSING. 4 credits

## GRADUATE COURSES

NSG 602—DIMENSIONS OF THE NURSING PROFESSION. 4 credits

Historical development of nursing as related to current issues and trends in nursing. Probable modifications of nursing roles in a dynamic and complex culture.

NSG 610—SEMINAR IN MEDICAL SURGICAL NURSING 1. 4 credits

Analysis of theories, principles and concepts of the biological, physical and social sciences needed in solving nursing problems of adult patients undergoing medical therapeutics or surgical intervention.

NSG 611—SEMINAR IN MEDICAL SURGICAL NURSING 2. 4 credits

Prerequisite: NSG 610. Continuation of NSG 610.

NSG 612—CLINICAL PRACTICE IN MEDICAL SURGICAL NURSING. 4 credits

Prerequisites: NSG 610, NSG 611. Application of scientific principles and concepts to the care of adults undergoing medical therapeutics or surgical intervention.

NSG 613—ADVANCED MEDICAL SURGICAL NURSING. 4 credits

Prerequisites: NSG 610, NSG 611, NSG 612. Critical analysis of nursing problems of adults undergoing medical therapeutics or surgical intervention.

NSG 620—ADVANCED PSYCHIATRIC AND MENTAL HEALTH NURSING. 4 credits

Application of normal and psychopathological processes to psychiatric nursing.

NSG 621—AREA SEMINAR IN CLINICAL NURSING: PSYCHIATRIC NURSING. 4 credits

Prerequisite: NSG 620. Investigation of selected psychiatric illnesses and concurrent clinical application of theory with emphasis on the nursing process and its effect on abnormal behavior.

NSG 622—ADVANCED PSYCHIATRIC NURSING: NURSING INTERVENTION IN MENTAL ILLNESS. 4 credits

Prerequisites: NSG 620, NSG 621. Investigation of psychotherapeutic approaches and processes with emphasis on applicability of specific characteristics to psychotherapeutic nursing processes.

NSG 623—Clinical Problems in Psychiatric Nursing. 4 credits
Prerequisites: NSG 620, NSG 621, NSG 622. Analysis of case materials and clinical problems related to the psychiatric nursing situation as an aid to assessing and managing patients' nursing requirements.

NSG 630—Individual Study. 4 credits
Reading and/or research in areas of nursing needed by graduate students. May be repeated with change of content up to a maximum of 12 credits.

NSG 640—Pediatric Nursing: Problems of the Well Child. 4 credits
Seminar devoted to the study of growth and development and the implications for child health care. Development of skill in interviewing, observation, and appraisal of growth and development.

NSG 641—Pediatric Nursing: Adolescent Health Care. 4 credits
Prerequisite: NSG 640. Common health problems of the adolescent. Implications of biological, socio-cultural and psychological factors in development of nursing care.

NSG 642—Pediatric Nursing: The Ill Child. 4 credits
Prerequisites: NSG 640, NSG 641. Seminar and practice in converting laws derived from physical, biological, and social sciences into principles of nursing care of the ill child.

NSG 643—Problems in Designing and Evaluating Nursing Care of Children. 4 credits
Prerequisites: NSG 640, NSG 641, NSG 642. A critical review of the theory and techniques of assessing and managing nursing requirements of children in the hospital and the community.

NSG 645—Seminar in Nursing Care of the Mentally Retarded Child. 4 credits
Role of the nurse as a member of the multi-disciplinary team in prevention and case finding of mental retardation and in follow-up care in the home and the institution.

NSG 650—Seminar in Maternal and Infant Health. 4 credits
The literature of the biological, physical, behavioral, and medical sciences which support nursing practice relating to the reproductive function and infant care.

NSG 651—Maternity Nursing Practices: Prenatal Period. 4 credits
Prerequisite: NSG 650. Development of a scientifically based nursing care of expectant mothers during the prenatal period, utilizing selected patient experiences for intensive study.

NSG 652—Maternal and Infant Health Practice:: Hospitalization Period. 4 credits
Prerequisites: NSG 650, NSG 651. Development of a scientifically based nursing care of mothers and infants during the hospitalization period, utilizing selected patient experiences for intensive study.

NSG 653—Problems in Designing and Evaluating Nursing Care. 4 credits
Prerequisites: NSG 650, NSG 651, NSG 652. Critical analysis and design of nursing care to meet the needs of mothers and infants that arise in a community setting.

NSG 660—Research Methods in Nursing. 4 credits
An introduction to research methods and their application to nursing; emphasis on critical analysis of published studies in nursing and the utility of findings.

NSG 670—Seminar: Dimensions of Functional Roles in Nursing. 4 credits

A core course for all students in the graduate program in nursing. Considers concepts fundamental to any functional role in nursing.

NSG 671—Practicum in Nursing. 4 credits

Individually planned experiences related to the functional goals of the student.

NSG 690—Residency. 12 credits

Prerequisites: Master's degree in nursing and admission to residency program. Supervised experience in approved settings. Designed as a sequence of 3 quarters. Reading assignments and individual and group conferences. May be repeated up to a maximum of 36 credits.

COLLEGE OF PHARMACY

PHARMACEUTICAL CHEMISTRY

PHARMACOGNOSY

PHARMACY

# PHARMACEUTICAL CHEMISTRY

## GRADUATE FACULTY 1966-67

GRAMLING, L. G., *Chairman*; FOOTE, P. A.; HAMMER, R. H.; LAUTER, W. M.; RAY, F. E.

*Prerequisite:* Graduation from an accredited college of pharmacy with the degree of Bachelor of Science with major in pharmacy or its equivalent.

## GRADUATE COURSES

PCY 611—SYNTHETIC MEDICINAL PRODUCTS 1. 3 credits
Preparation of the more complex synthetic medicinals. The relationship between chemical constitution and physiological action.

PCY 612—SYNTHETIC MEDICINAL PRODUCTS 2. 3 credits
Continuation of PCY611.

PCY 613—SYNTHETIC MEDICINAL PRODUCTS 1. 3 credits
Accompanying laboratory course for PCY 611. Synthesis of organic medicinal compounds.

PCY 614—SYNTHETIC MEDICINAL PRODUCTS 2. 3 credist
Accompanying laboratory course for PCY 612. Synthesis of organic medicinal compounds.

PCY 615—SYNTHETIC MEDICINAL PRODUCTS 3. 3 credits
Continuation of PCY 612.

PCY 621—NATURAL MEDICINAL PRODUCTS 1. 3 credits
Chemistry of compounds derived from plants and animals.

PCY 622—NATURAL MEDICINAL PRODUCTS 2. 3 credits
Continuation of PCY 621.

PCY 623—NATURAL MEDICINAL PRODUCTS 1. 3 credits
Accompanying laboratory course for PCY 621. Isolation and identification of plant and animal products.

PCY 624—NATURAL MEDICINAL PRODUCTS 2. 3 credits
Accompanying laboratory course for PCY 622. Isolation and identification of plant and animal products.

PCY 625—NATURAL MEDICINAL PRODUCTS 3. 3 credits
Continuation of PCY 622.

PCY 631—ANALYTICAL AND CONTROL METHODS 1 5 credits
Analytical and control methods, with emphasis on the more complicated procedures of the U.S.P., N.F., A.O.A.C. and recent literature.

PCY 632—ANALYTICAL AND CONTROL METHODS 2. 5 credits
Continuation of PCY 631.

PCY 633—ANALYTICAL AND CONTROL METHODS 3. 5 credits
Continuation of PCY 632.

PCY 642—CHEMOBIODYNAMICS. 5 credits
Prerequisite: PCY 611. A theoretical treatment of structure-activity relationships and approaches to drug design.

PCY 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

PCY 799—DOCTORAL RESEARCH. 1 to 12 credits

# PHARMACOGNOSY

## GRADUATE FACULTY 1966–67

JOHNSON, C. H.

*Prerequisite:* Graduation from an accredited college of pharmacy with the degree of Bachelor of Science with major in pharmacy or its equivalent.

### GRADUATE COURSES

PGY 601—ADVANCED HISTOLOGY AND MICROSCOPY OF VEGETABLE DRUGS. 5 credits
Advanced study of microscopic structure and identification of drugs.

PGY 603—MICROANALYTICAL PHARMACOGNOSY. 2 credits
A study of plant constituents employing micro methods.

PGY 604—CULTIVATION AND PROCESSING OF MEDICINAL PLANTS. 3 credits
Commercial sources, culture, and preparation of botanical drugs.

PGY 625—DRUG PLANT ANALYSIS. 2 to 4 credits
Chemical constituents and their identification and determination in drug plants.

PGY 626—DRUG PLANT ANALYSIS. 2 to 4 credits
Continuation of PGY 625.

PGY 627—DRUG PLANT ANALYSIS. 2 to 4 credits
Continuation of PGY 626.

PGY 699—MASTER'S RESEARCH. 0 to 9 credits. Maximum 24 credits

PGY 799—DOCTORAL RESEARCH. 1 to 12 credits

# PHARMACY

## GRADUATE FACULTY 1966-67

BECKER, C. H., *Chairman*; ARAUJO, O. E.; GARRETT, E. R.

*Prerequisite:* A Bachelor of Science degree with a major in pharmacy, in physical sciences or in biological sciences is required for admission to the Doctor of Philosophy program. Applicants should present standard undergraduate sequences in chemistry, including qualitative, quantitative, organic and physical; one year of physics and mathemathics through the calculus. Any deficiencies must be made up immediately after entering Graduate School.

### COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

PHY 566—DERMATOLOGICAL PROTECTIVES. 5 credits

### GRADUATE COURSES

PHY 601—HOSPITAL PHARMACY ADMINISTRATION. 3 credits
Prerequisite: PHY 532 or classification as hospital pharmacy intern. Development, functions, responsibilities, organization and administration of the hospital and the hospital pharmacy department. Presented from the viewpoint of the administrative responsibilities of the hospital pharmacist.

PHY 602—SELECTED TOPICS IN PHARMACY. 3 credits
Selected problems of current interest.

PHY 603—Research Methods in Pharmaceutical Sciences. 2 to 6 credits

Prerequisites: MS 302, CY 451. Introduction to pharmaceutical research in which the student acquires proficiency in research techniques and instrumentation used in physical pharmacy, drug stability, kinetics and pharmacokinetics, under supervision of a staff member.

PHY 604—Equilibria, Complexations and Interactions of Drugs. 5 credits

Prerequisites: CY 453, MS 304 or MS 501 or special arrangement. Models for drug interactions in solution. Physical chemical characterizations of drugs and their complexes in pharmaceutical systems.

PHY 605—Stability and Kinetics of Drugs. 5 credits

Prerequisites: CY 644, CY 662, STA 521, PHY 604 or special arrangement. Kinetics, mechanisms and prediction of stability of *in vitro* transformations of drugs, including alkaloids, vitamins, steroids, salicylates and their pharmaceutical formulations; application of analog computer.

PHY 606—Pharmacokinetics and Biopharmaceutics. 5 credits

Prerequisites: PHY 605 and a course in pharmacology, or by special arrangement. *In vivo* transformations of drugs and compartmental analysis with analog computer; absorption, transfer, protein binding, metabolism, excretion, receptor site interaction and biological availability from the dosage form.

PHY 607—Advanced Topics in Pharmaceutical Sciences. 1 to 2 credits

Presentation of oral reports on selected topics related to the pharmaceutical sciences; discussion and critical review of such topics; written and oral presentations of research designs, protocols, papers and critical appraisals.

PHY 611—Hospital Pharmacy Seminar. 1 credit

Prerequisite: Classification as hospital pharmacy intern. Master's candidates specializing in hospital pharmacy must register for this course each quarter but not more than 3 credits will be allowed. Presentation of oral reports on topics related to hospital pharmacy. Discussion of problems dealing with these topics.

PHY 643—Pharmaceutical Equipment and Machinery. 4 credits

Industrial pharmaceutical machinery and equipment such as colloid mills and homogenizers, sifters, pulverizers, centrifuges, tablet machines and ampul washers, fillers and sealers. Manufacture of pharmaceutical products on a pilot-plant scale in the laboratory.

PHY 645—Pharmaceutical Machinery and Product Formulation. 4 credits

A continuation of PHY 643 with emphasis on rationale and design of some pharmaceutical dosage forms, particularly on such aspects as inherent physical and chemical problems, stability and biopharmacy. Selected formulas are prepared for evaluation on a laboratory and pilot-plant scale.

PHY 647—Pharmaceutical Product Formulation. 4 credits

Continuation of PHY 645. Discussion of rationale and design of some pharmaceutical dosage forms, particularly on such aspects as inherent physical and chemical problems, stability and biopharmacy. Selected formulas are prepared for evaluation on a laboratory and pilot-plant scale.

PHY 653—Parenterals. 5 credits

Fundamental techniques of preparation, administration, and testing of materials designed for parenteral injection.

PHY 699—Master's Research. 0 to 9 credits. Maximum 24 credits

PHY 799—Doctoral Research. 1 to 12 credits

# COLLEGE OF PHYSICAL EDUCATION AND HEALTH

## PHYSICAL EDUCATION, HEALTH AND ATHLETICS

# PHYSICAL EDUCATION, HEALTH AND ATHLETICS

## GRADUATE FACULTY 1966-67

SANDEFUR, W. T., *Chairman*; BOYD, C. A.; CHERRY, H. S.; HICKS, D. A.; LEAVITT, N. M.; SALT, E. B.; STANLEY, D. K.; STERLING, L. F.; STEVENS, B. K.; WAGLOW, I. F.; ZAUNER, C. W.

*Prerequisite* for admission to graduate study is an undergraduate major in physical education. A thesis degree, Master of Arts in Physical Education and Health, and a non-thesis degree, Master of Physical Education and Health, are offered. The major is physical education.

## COURSE FOR ADVANCED UNDERGRADUATES AND GRADUATES

PHA 560—ADMINISTRATION OF SCHOOL HEALTH PROGRAMS. 5 credits

## GRADUATE COURSES

PHA 601—INTERPRETATIONS OF PHYSICAL EDUCATION. 3 credits
Biological, psychological, sociological and educational implications needed to interpret the function of physical education in contemporary democratic society.

PHA 603—NATURE AND BASES OF MOTOR PERFORMANCE 5 credits
Principles relating to the development of motor skill, emphasizing conditions affecting its development and retention in physical education activities.

PHA 605—RESEARCH METHODS IN PHYSICAL EDUCATION, HEALTH EDUCATION, RECREATION. 5 credits

PHA 606—INDIVIDUAL WORK. 1 to 5 credits
Prerequisite: PHA 605. Individual research projects under faculty guidance.

PHA 607—SEMINAR IN PHYSICAL EDUCATION. 2 credits
Research implications for the field of physical education. May be repeated with change of content up to a maximum of 4 credits.

PHA 610—EVALUATION PROCEDURES IN PHYSICAL EDUCATION AND HEALTH EDUCATION. 3 credits
Concepts and methods of measurement and evaluation as applied to physical education and health education.

PHA 612—PHYSIOLOGICAL BASES OF PHYSICAL EDUCATION. 5 credits
Application of fundamental concepts of human physiology to programs of physical education and sports. Emphasizes recent research developments in sports physiology.

PHA 613—PRACTICUM IN EXERCISE PHYSIOLOGY. 3 credits
Prerequisite: PHA 612. Applied and experimental work emphasizing practical problems.

PHA 616—THE PHYSICAL EDUCATION CURRICULUM. 5 credits
Principles and practices of developing an integrated physical education curriculum in grades 1 to 12.

PHA 618—THE COLLEGE PHYSICAL EDUCATION PROGRAM. 5 credits
Philosophy, program content, administration and methods of conducting the required intramural and professional preparation programs of physical education in colleges and universities.

PHA 620—Problems in the Administration of Athletics. 5 credits
The interscholastic athletic program; the place of athletics in education, program organization and administration, budget, equipment, facilities, intramurals, public relations and legal liability.

PHA 633—Problems in Physical Education. 5 credits
Prerequisite: PHA 605. Identification and analysis of contemporary problems in physical education. Emphasizes research developments.

PHA 645—Physical Education Workshop Series. 1 to 10 credits
Cooperative study of special problems in physical education.

PHA 661—Scientific Foundations of Health. 5 credits
Prerequisites: PHA 261, PHA 262 or consent of instructor. Independent study and investigation of current problems and advances in health sciences, applied to personal and community health.

PHA 699—Master's Research. 0 to 9 credits. Maximum 24 credits

# *Index*


Abstract: thesis, 25; special abstract, 25.
Accounting, 148.
Administration, officers of, v–vii.
Admission: general requirements, 4; to candidacy, 12, 14, 35 (*see also* various degrees); of faculty members, 9; foreign students, 6; GENESYS, 5; provisional, 8; second graduate program, 8; trial programs, 8.
Advanced School, College of Education, 27.
Aerospace Engineering, 179.
Agriculture, College of, 64.
Agricultural: economics, 64; education (*see* Education—Agricultural and Extension), 174; engineering, 180; experiment station, 56; extension, 174.
Agronomy, 66.
Anatomy, 220.
Animal Science, 68.
Anthropology, 96.
Application: for admission, 4, 36; for degrees, 14, 38; for housing, 40.
Architectural and Community Research, Bureau of, 58.
Architecture and Fine Arts, College of, 91.
Architecture, 92.
Art, 93.
Arts and Sciences, College of, 95; general, 96.
Assistantships and fellowships: hours of employment, 10; maximum and minimum loads, 10; required registration, 10; stipends, 45.
Astronomy, 98.
ATGSB (Advanced Test for Graduate Study in Business), 7.
Audit fee, 38.
Awards, 42.

Bacteriology, 70.
Biochemistry, 218, 221.
Bioenvironmental Engineering, 181.
Biological Sciences, Division of, 49, 158.
Boards: of Education of Florida, v; of Regents of Florida, v.
Botany, 72.
Building Construction, 94.
Bureaus: of Architectural and Community Research, 58; of Economic and Business Research, 58.
Business Administration, College of, 145; general, 146.
Business Education (*see* Secondary Education), 172.

Change of major, 13.
Chemical Engineering, 184.
Chemistry, 99.
Civil Engineering, 188.
Commencement, attendance at, 14.
Communications, 141.
Computing Center, 55.
Continuing Education, Centers for, 12, 19, 49.
Copyright, 36.
Corry Village, 42.
County Agents: admission of, 9; residence for master's degrees, 14.
Courses: of instruction, 61; levels, 11; numbers, 11; by correspondence and extension, 12.
Credit hours, definition of, 10.
Credits (*see* courses), 11.
Curriculum and Instruction (*see* Ed.D.), 29.

Dairy Science, 74.
Deadline dates: admission to candidacy (*see* specific dgree); application for degree (*see Calendar*); application for GRE, 6; application for language examinations (*see Calendar*); submission of thesis and dissertation (*see Calendar*).
Degrees, general requirements for (*see* specific degree); master's with thesis, 25; non-thesis master's, 15; Specialist in Education, 28; doc-

toral, 29, 31; time limitations on degrees, 15, 29, 35.
Deposits, 35, 39.
Diamond Village, 42.
Dissertation: copyright, 36; deposit, 35, 39; general requirements, 35; preparation of, 35; publication, 35.
Division of Sponsored Research, 56.
Dormitories, 40.
DuPont Postgraduate Teaching Assistant, 43.

Economic and Business Research, Bureau of, 58.
Economics, 147.
Editorial Service, Graduate School, 60.
Ed.D., requirements for, 29.
Ed.S., requirements for, 28.
Education, College of, 159.
Education: administration and supervision, 163; Advanced School of, 27; elementary, 165; foundations of, 166; general and cross departmental, 160; personnel services, 168; secondary, 172; agricultural and extension, 174.
Educational Testing Service (ETS): ATGSB, 7; foreign language examinations, 26 (*see also Calendar*); GRE, 5-6, 38; TOEFL, 6.
Electrical Engineering, 192.
Engineering, College of, 177; and Industrial Experiment Station, 57; Off-Campus Centers, 49.
Engineering Science and Mechanics, 197.
English, 103.
Entomology, 75.
Environmental Engineering, 3 (*see* Bioenvironmental Engineering).
Examinations (*see* various degrees).
Expenses, 36-40.
Experiment Stations, 56-57.
Extension work, 12.
Facilities, 53.
Faculty: graduate (*see* specific departments); members, admission of, 9.
Fees: application, 36; registrational and instructional, 37.
Fellowships: American Foundation for Pharmaceutical Education, 44; Fulbright-Hays, 47; Graduate, 42, 45; H. Harold Hume, 43; NDEA Graduate, Title IV, 46; NDEA Modern Foreign Language, Title VI, 46; Tennessee Eastman, 43; United States Steel Foundation, 45.
Final examination (*see* specific degree).
Finance and Insurance, 153.
Financial aid, 42.
Flavet Apartment Village, 42.
Florida: Board of Regents, v; Engineering and Industrial Experiment Station, 57; State Board of Education, v; State Museum, 53; Student classification, 36.
Food Science, 77.
Ford Foundation Three-Year Master's Program, 52.
Foreign Languages, 105.
Foreign language examinations, 13, 32-34.
Foreign students: adviser to, 58; Graduate Record Examination, 6; special procedures for, 6.
Forestry, 88.
Foundation Work (*see* specific degree).
French, 106.
Fruit Crops, 78.

Gallery, University and Teaching, 54.
General regulations and instructions, 9; for master's degrees, 14; for Specialist in Education degree, 28; for doctoral degrees, 29, 31.
GENESYS, 5, 38, 50.
Geography, 109.
Geology, 111.
German, 107.
Governmental Planning Sequence in Public Administration, 50.
Grades, 12; grade averages for admission, 4; candidacy, 12; satisfactory progress, 12; trial programs, 8.
Graduate Council, vii.
Graduate Record Examination (GRE): requirements, 6; fee, 38; foreign students, 6; postponement of, 7.
Graduate School: administration, faculty (*see* specific departments);

history, 1; organization, 1; programs (*see* degrees offered), 2; residence centers, 12, 19.
Grants-in-Aid, 42.

Health and Hospital Administration, 155.
Health Related Professions, College of, 215.
Health Services, Student, 60.
History, 112.
Housing: application for, 40; married students, 41; off-campus, 42; residence for single men, 41.

Industrial assistantships in Engineering, 43.
Industrial and Systems Engineering, 201.
Infirmary (*see* Student Health Services), 60.
International Relations, 51.
Journalism, 142.
Journalism and Communications, Research Division, 58; School of, 141.
Junior college teachers, degrees for, 51.
Language and Area Program, 48.
Languages: examination procedures, 32; requirements for master's degrees (*see* specific degree); requirements for doctor's degrees, 32; substitutions for, 33.
Latin, 107.
Latin American Studies, 48.
Latin American Language and Area Program (NDEA), 49.
Libraries, University, 49, 53.
Library Science, 115.
Loads, maximum and minimum, 10.
Loans, 47.

Majors: change of, 13; master's degrees, 14 (*see also* specific dgrees); Ed.D. degree, 3, 29; Ph.D. degree, 3, 31.
Management and Business Law, 156.
Marketing, 157.
Married student housing, 41.
Master's degrees: Agriculture, 2, 15; Arts, 3, 25; Arts in Architecture, 3, 25; Arts in Education, 3, 25; Arts in Journalism and Communications, 3, 25; Arts in Physical Education and Health, 3, 25; Business Administration, 2, 16; Education, 2, 18; Engineering, 2, 20; Fine Arts, 3, 27; Nursing, 2, 21; Physical Education and Health, 2, 22; Rehabilitation Counseling, 2, 22; Science, 3, 25; Science in Agriculture, 2, 25; Science in Building Construction, 2, 25; Science in Engineering, 2, 25; Science in Forestry, 3, 25; Science in Pharmacy, 3, 25; Science in Statistics, 3, 25; Science in Teaching, 2, 15; Statistics, 2, 25.
Mathematics: courses, 115; as substitution for a foreign language, 33.
Mechanical Engineering, 205.
Medical Sciences: Anatomy, 220; Biochemistry, 221; General, 219; Microbiology, 222; Pathology, 224; Pharmacology, 225; Physiology, 226; Radiology, 227.
Medicine, College of, 217.
Metallurgical and Materials Engineering, 208.
Microbiology, 222.
Miller Analogies Test (*see* Advanced School), 7.
Minors: master's degrees (*see* specific degree); Ed.D. degree, 29; Ph.D. degree, 31.
Monograph Series: Humanities and Social Sciences, 56.
Museum, Florida State, 53.

National Defense Student Loan Program, 47.
NDEA: Graduate Fellowships, Title IV, 46; Modern Foreign Language Fellowships, Title VI, 46; Student Loans, 47.
Non-credit language courses, 33.
Non-Florida students: classification of, 36; non-resident tuition scholarships, 45.
Non-thesis degrees, 2, 15.
Nuclear Engineering Sciences, 210.
Nursing, College of, 231; courses, 232.
Oak Ridge, Research Program at, 52.

Off-Campus: credits, 12, 15, 29; Engineering Centers, 49; housing, 42.
Ornamental Horticulture, 80.

Pharmaceutical Chemistry, 236.
Pharmacognosy, 237.
Pharmacology, 225, 229.
Pharmacy, College of, 235; courses, 237.
Ph.D., requirements for, 31.
Philosophy, 119.
Physical Education and Health, College of, 239.
Physical Education, Health, and Athletics, 240.
Physics, 120.
Physiology, 226.
P. K. Yonge Library of Florida History, 53.
Placement Service, 59.
Plant Pathology, 81.
Political Science, 124.
Portuguese, 108.
Poultry Science, 82.
Prerequisites (*see* specific department).
Press, University, 55.
Psychology, 128.
Public Administration: Clearing Service, 58; programs, 50; Governmental Planning Sequence, 50.

Qualifying examination, 34 (*see* Ed.D., Ph.D.).
Quarter: definition of, 10; procedures for final quarter, 13-14.

Radiation Biophysics, 3 (*see* Radiology).
Radiology, 227.
Real Estate and Urban Land Studies, 158.
Re-examinations, 34.
Refunds: fees, 39; dissertation deposit, 35; registration and tuition, 39.
Registration: fees, 37; maximum and minimum hours, 10; final quarter, 13; re-registration denied, 12; undergraduates in graduate courses, 9; required registration, 9.
Regulations, general, 9.
Rehabilitation Counseling, 216.
Research (Organized), 56-58.
Residence: credit for employment on basic research, 34; general requirements, 34 (*see also* specific degree); for county agents, 14.
Residence halls for single men, 41.
Schucht Memorial Village, 42.
Scholarships, non-Florida tuition, 45.
Sociology, 131.
Soils, 83.
Spanish, 108.
Specialist in Education degree, 28.
Speech, 134; and Hearing Clinic, 60.
Sponsored Research, Division of, 56.
Statistics, 84.
Students: aid, 42; Florida and non-Florida classifications, 36; health services, 60; responsibilities, 9; services, 58.
Supervisory Committee, 26, 31 (*see also* specific degree).
Systems Engineering (Operations Research), degree, 4 (*see* Industrial and Systems Engineering).

Tennessee Eastman Fellowship, 43.
Thesis: degrees, 25; general information, 25; preparation of, 25, 60.
Three-Year Master's Program, 52.
Testing of English as a Foreign Language (TOEFL), 6.
Traffic and safety regulations, 40.
Traineeships: Health and Hospital Administration, 43; NASA, 46; NSF Graduate, 46; Nursing, 44; Rehabilitation Counseling, 44; Speech, 45.
Transfer of credit: master's degrees, 15; Ed.S. degree, 29.
Traveling Scholar Program, 50.
Tuition fees, 37.

United States Steel Foundation Fellowship, 45.
Urban Problems, 51.

Vegetable Crops, 86.
Veterans Administration Information, 10.
Veterinary Science, 87.
Vocational Agriculture (*see* Agricultural and Extension in the College of Education), 174.

Zoology, 138.

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Ser. 1
no. 1
1967

*Graduate Catalog / 1967-1968*